

The Natural & Beneficial Functions Of Floodplains

*Reducing Flood Losses By Protecting And
Restoring The Floodplain Environment*



June 2002

A Report For Congress By The Task Force On The
Natural And Beneficial Functions Of The Floodplain

The Natural And Beneficial Functions Of Floodplains

*Reducing Flood Losses By Protecting
And Restoring The Floodplain Environment*

June 2002

A Report For Congress By The Task Force On The
Natural And Beneficial Functions Of The Floodplain

PREFACE

This report documents the findings and recommendations of the Task Force on the Natural and Beneficial Functions of the Floodplain. The Task Force was established by Congress under Section 562 of the National Flood Insurance Reform Act of 1994 to:

- identify the natural and beneficial functions of floodplains that reduce flood losses; and
- recommend how the nation can further reduce flood losses through the protection and restoration of the natural and beneficial functions of the floodplain.

Congress directed the Task Force to make the information it gathered and the recommendations available to the public.

Members of the Task Force designated by Congress included:

Federal Emergency Management Agency (FEMA), *Elected Chair*
National Oceanic and Atmospheric Administration (NOAA)
U.S. Fish and Wildlife Service (FWS)
Environmental Protection Agency (EPA)
U.S. Army Corps of Engineers (USACE)

Other members of the Task Force included:

National Park Service Rivers, Trails, and Conservation Assistance
Program (Rivers & Trails)
Natural Resource Conservation Service (NRCS)

The Task Force concluded that protecting and restoring the natural and beneficial functions of floodplains will not only reduce flood damages, but also contribute to a community's social and economic well-being. As we continue to live in close proximity to rivers and streams, naturally functioning floodplains will become increasingly critical community assets. Preservation and restoration of the natural and beneficial functions and values of floodplains depends on preventative floodplain management policies, programs, and initiatives. While much of this will occur as a result of initiatives at the state and local levels, Federal programs and policies must support and encourage these efforts.

The Task Force would like to thank URS Corporation for their assistance in supporting the Task Force and developing the report, and Jon Kusler for his guidance and expertise. As Chair of the Task Force, FEMA would also like to thank the Task Force members representing the member agencies and the numerous staff of the participating agencies who contributed to the development of the recommendations and the report.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	ES-1
-------------------------	------

Section One

INTRODUCTION	1-1
--------------------	-----

Section Two

THE NATURAL AND BENEFICIAL FUNCTIONS OF FLOODPLAINS

2.1 What Are Floodplains and Why Are They Important?	2-1
2.1.1 Riverine Floodplains	2-1
2.1.2 Coastal Floodplains	2-3
2.2 The Natural and Beneficial Functions of Floodplains	2-4
2.2.1 Water Resources Functions	2-5
2.2.2 Ecological Functions	2-7
2.2.3 Functions of Coastal Floodplains	2-9
2.3 Human Values of Floodplains	2-11

Section Three

THE IMPACT OF HUMAN ACTIVITIES ON FLOODPLAINS

3.1 Impacts of Flood Control and Other Water Resources Structures	3-1
3.2 Impacts of Changes in Land Use	3-3

Section Four

THE CURRENT STATE OF FLOODPLAIN MANAGEMENT AND CHALLENGES TO POLICY MAKERS

4.1 The Current State of Floodplain Management	4-1
4.2 The Challenges in Floodplain Management for Policy Makers ..	4-4

Section Five

TASK FORCE RECOMMENDATION	5-1
---------------------------------	-----

Section Six

SELECTED BIBLIOGRAPHY	6-1
-----------------------------	-----

Appendix A

FEDERAL PROGRAMS RELATING TO THE NATURAL AND BENEFICIAL FUNCTIONS OF FLOODPLAINS

Federal Emergency Management Agency	A-1
U.S. Army Corps of Engineers	A-4
U.S. Department of Commerce	A-5

U.S. Department of Agriculture	A-8
U.S. Environmental Protection Agency	A-11
U.S. Department of Interior	A-14

Appendix B

CASE STUDIES

Napa Valley, California	B-1
Darlington, Wisconsin	B-3
Baltimore County, Maryland	B-5
Oregon and Washington	B-8
Prince George's County, Maryland	B-10
Santa Clara River, California	B-13
Staten Island Wetlands, New York	B-15
Westernport, Maryland	B-17

Appendix C

SECTION 562 OF THE NATIONAL FLOOD INSURANCE

REFORM ACT OF 1994	C-1
--------------------------	-----

Appendix D

PRESIDENTIAL EXECUTIVE ORDERS	D-1
-------------------------------------	-----

Appendix E

TASK FORCE AGENCIES	E-1
---------------------------	-----

In formulating its recommendations, the Task Force followed these guiding principles:

- Focus on natural, non-structural solutions that reduce susceptibility to flooding, while preserving the flexibility to use more traditional structural approaches where appropriate;
- Create a framework for more effective Federal, state, tribal, and local coordination;
- Create and encourage community and private partnerships;
- Aim for watershed-based solutions.

The findings of the Task Force clearly support the need for long-term research, planning and policy initiatives that use an integrated and unified approach from

Federal, state and local governments and focus on natural flood-loss reduction solutions. Not only would these efforts enhance the protection, restoration, and management of natural floodplains and their functions, but they would also achieve environmental, social, and economic benefits by reducing the severity and frequency of flood losses, and the subsequent need for disaster relief and recovery operations. The Task Force's recommendations are shown in Table ES-1. Improve the analytical approaches to floodplain management by providing scientific and technical assistance, including economic guidance, to organizations with floodplain management responsibilities.

Encourage natural, non-structural solutions to reducing flood damages where practicable.

Improve coordination and partnerships among all levels of government and other parties to facilitate the protection and restoration of floodplains.

Evaluate various Federal programs that impact floodplains and ensure that Federal agency implementation of floodplain management objectives are complementary and that Federal programs are working to achieve the same goals.

Table ES-1. Recommendations

- Develop an updated and expanded national policy on the protection and restoration of the natural and beneficial functions of floodplains as an integral part of all Federal, state, tribal, and local government programs, actions, planning, policies, regulations, and grants.
- Encourage a proactive and long-term approach to floodplain management, including the development of pre- and post-disaster plans for flood damage reduction and preservation/restoration of natural and beneficial functions.
- Enhance the capabilities of state, tribal, and local programs and planning processes that protect and restore natural and beneficial floodplain functions.
- Focus restoration and protection efforts on those floodplains or portions of floodplains identified as having the greatest flood risks and significant natural and beneficial functions.
- Improve the analytical approaches to floodplain management by providing scientific and technical assistance, including economic guidance, to organizations with floodplain management responsibilities.
- Encourage natural, non-structural solutions to reducing flood damages where practicable.
- Improve coordination and partnerships among all levels of government and other parties to facilitate the protection and restoration of floodplains.
- Evaluate various Federal programs that impact floodplains and ensure that Federal agency implementation of floodplain management objectives are complementary and that Federal programs are working to achieve the same goals.

Section One INTRODUCTION

People have always been attracted to water. Historically, settlements have arisen along waterways because floodplains contain natural features beneficial to human societies. Floodplains provide fertile soil for agriculture, transportation and commerce links, water supply, hydropower, and aesthetic beauty. Floodplains are also dynamic ecosystems that perform many functions critical to the ecology of a river or stream. Floodplains provide groundwater recharge, filter sediment and contaminants, transport nutrients, and support habitats for some of our most sensitive living resources. Floodplains also reduce flooding and limit flood-related damages through their floodwater conveyance and storage functions.

Even though the natural functions of floodplains and the hazards associated with their occupancy are widely known, natural floodplains and their functions continue to be lost to encroaching development, mining, agriculture, and other activities. These activities have altered the floodplain landscape, and have not only impacted the ecological integrity of our nation's watercourses, but have resulted in significant social and economic consequences. Floods in developed floodplains devastate families, businesses, and communities, and cause more damage to life and property than any other natural hazard.

The approach to dealing with floods has undergone a significant change in the United States during the Twentieth Century. Until the 1960's the Federal Government attempted to control floods solely through structural methods, such as dams, levees, and stream channelization. However, flood losses and disaster relief costs continued to rise.

Beginning in the mid-1960s, Federal policy broadened to include considerations of using nonstructural means to reduce the loss of life and property caused by floods (Natural Hazards Research and Applications Information Center, 1992). Also during this time there began to be a recognition of the importance of protecting and restoring the natural and beneficial functions of floodplains. In 1966, the Task Force on Federal Flood Control Policy completed its report, *A Unified National Program for Managing Flood Losses*, House Document 465. This report was prepared to assess flood control policies and to provide recommendations to slow the mounting toll of flood losses.

In 1968, Congress passed the National Flood Insurance Act, which established the National Flood Insurance Program (NFIP). The NFIP made federally supported flood insurance available to those communities that adopted and enforced floodplain management regulations that met the minimum standards set forth by the NFIP. The NFIP marked a significant shift from traditional structural methods of flood control toward non-structural floodplain management.



Providing habitats for a wide variety of species, such as the endangered whooping crane, is just one of the many functions of floodplains.

J. McShane

In 1975, the U.S. Water Resources Council (WRC) created the Federal Interagency Floodplain Management Task Force to periodically report to Congress through the President on the progress made toward achieving the goals of floodplain management. In 1976, the Task Force prepared the report, *A Unified National Program for Floodplain Management*, pursuant to Section 1302(c) of the National Flood Insurance Act of 1968, and presented the document to the President for submittal to Congress. In 1977, the President signed *Executive Order 11988, Floodplain Management*, in recognition of the need to "... avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative..." E.O. 11988 directed Federal agencies "... to provide leadership and take action to reduce the risk of flood loss, minimize the impact of flood events on human safety, health and welfare, and restore the natural and beneficial values served by floodplains..." At the same time, *Executive Order 11990, Protection of Wetlands*, was issued to protect wetland resources.

The Federal Interagency Floodplain Management Task Force updated and revised the Unified National Program document in 1979. This revision incorporated Federal concern for natural and beneficial values of floodplains, responded to Presidential policy directives, expanded strategies to include restoration and preservation of natural values, and addressed the lack of awareness of alternative strategies for reducing flood losses. In 1982, after the WRC was disbanded, OMB assigned responsibility for the Unified National Program to the Federal Emergency Management Agency (FEMA), which assumed the Chair of the Task Force.

An updated Unified National Program report was prepared by the Task Force and submitted to the Congress by the President in 1986. This report (1) set forth a conceptual framework for floodplain management; (2) identified strategies and tools for reducing flood losses and protecting and restoring the natural resources and functions of floodplains; (3) assessed the floodplain management capability of Federal and State agencies and programs, as well as those of local governments; and (4) made recommendations to further reduce the loss of life and property caused by floods and to protect and restore the natural resources and functions of floodplains.

In 1992, the Task Force completed a comprehensive report, *Floodplain Management in the United States, an Assessment Report* and noted that "as the latest addition to an array of floodplain management strategies and the one least well-integrated with the others, it is not surprising that this strategy [restoring and preserving the natural and cultural resources of floodplains] has met with limited success. It has been difficult to quantify the value of natural and cultural resources of floodplains and therefore difficult to justify government expenditures to preserve floodplains in their natural state." The findings of this report were timely, when, following major flooding along the Mississippi River and its tributaries in 1993, there was renewed interest in floodplain management strategies, particularly those that protect natural floodplains.

Following the Mississippi River flood of 1993, the Interagency Floodplain Management Review Committee was established to determine the major causes and

consequences of the flood, and to evaluate the performance of existing floodplain and related watershed management programs. The committee's report, *Sharing the Challenge: Floodplain Management into the 21st Century*, recommended changes in current policies, programs and activities of the Federal government with regard to risk reduction, economic efficiency, and the environmental enhancement of floodplains and adjacent watersheds.

In 1994, the Interagency Floodplain Management Task Force once again updated the document, *A Unified National Program for Floodplain Management*. The 1994 report included the preservation and restoration of natural functions of floodplains as one of four major strategies suggested for managing floodplains and emphasized that the two, co-equal goals of floodplain management are the reduction of flood losses and the protection and restoration of the natural resources and functions of floodplains. The Task Force also called for the restoration of degraded floodplains and the preservation and protection of floodplain areas that are still relatively undisturbed. The concept of "wise-use" was expanded to include the protection and the preservation of the natural functions of floodplains. Further information for local officials, conservation groups and the general public was provided by the Task Force in its 1996 publication, *Protecting Floodplain Resources: A Guidebook for Communities*.

In 1994, Congress passed the National Flood Insurance Reform Act and, in Section 562, established the interagency "Task Force on Natural and Beneficial Functions of the Floodplain." The Task Force was directed to identify the natural and beneficial functions of the floodplain that reduce flood-related losses, and to develop recommendations on diminishing flood losses by protecting these natural functions. The information and recommendations were to be provided to Congress and made available to the public.

This Report focuses on the natural and beneficial functions of floodplains and how these natural functions can contribute in a significant manner toward reducing flood losses. Additionally, this report discusses how protecting and restoring naturally functioning floodplains can provide society with numerous economic and environmental benefits.



A UNIFIED NATIONAL PROGRAM FOR FLOODPLAIN MANAGEMENT 1994

Federal Interagency Floodplain Management Task Force

The 1994 document "A Unified National Program for Floodplain Management" emphasized that the two, co-equal goals of floodplain management are to reduce flood losses and to protect and restore the natural resources and functions of floodplains.

2.1 What Are Floodplains and Why Are They Important?

Floodplains are the low areas adjacent to rivers, lakes, and oceans that are periodically flooded at intervals of varying frequency (Federal Interagency Stream Restoration Working Group, 1998; Interagency Floodplain Management Task Force, 1994). Floodplains are important components of their respective watersheds. Watersheds are defined areas of land that drain water, sediment and dissolved materials to a common outlet at some point along a stream channel (Federal Interagency Stream Restoration Working Group, 1998, citing Dunne and Leopold, 1978). Floodplains are hydrologically important, environmentally sensitive and ecologically productive areas within a watershed that perform many natural functions. They contain a wealth of cultural and natural resources that are of enormous value to society.

Flooding is a natural phenomenon of every river, and is extremely important to the maintenance of floodplain ecosystems and channel stability. Floodplain environments are dynamic in nature and are highly productive biological communities given their proximity to water and the presence of fertile soils and nutrients. Floodwaters carry nutrient-rich sediments and trigger chemical processes that cause beneficial changes in the soil, which contribute to a fertile environment for vegetation (Interagency Floodplain Management Review Committee, 1994, citing P.B. Bayley, 1991; Federal Interagency Floodplain Management Task Force, 1996). Floodplains preserve biodiversity by creating a variety of habitats, including breeding and feeding areas for fish and wildlife. In addition, floodplains are hydrologically important components of a watershed because of their flood storage and conveyance, protection of water quality, and recharge of ground water functions.

2.1.1 Riverine Floodplains

Riverine systems vary in steepness, width, stream flow, sediment deposition and erosive characteristics. This becomes readily apparent as one moves downstream from narrow headwater streams to lower gradient streams with wider floodplains. The natural functions that are associated with a particular floodplain depend in part on its location within this continuum.

The frequency, duration and extent of flood events will vary among different types of floodplains, dependent upon their hydrology, geomorphology, and amount of floodplain development.

Section Two THE NATURAL AND BENEFICIAL FUNCTIONS OF FLOODPLAINS



The Yellowstone River in Yellowstone National Park is one of the few rivers in America that still has a naturally functioning riparian and floodplain system.

J. McShane

Floodplains are formed and modified by the dynamics of stream and river migration and periodic flooding (Figure 2-1) (Federal Interagency Stream Restoration Work Group, 1998). Although many riverine floodplains usually flood during the spring, they can also experience multiple flood events within the same year with duration varying from hours to days. Periodic flooding of riverine systems and the related processes of erosion and deposition determine, to a considerable extent, the shape of the floodplain (e.g., often flat); the depth and composition of soils (e.g., often alluvial organic soils); the type and density of vegetation; presence and extent of wetlands; richness and diversity of wildlife habitats; and depth to the groundwater.

The major flood conveyance component of the floodplain is the floodway (Figure 2-2). The National Flood Insurance Program (NFIP) defines the floodway as

Figure 2-1. River Dynamics

(Adapted from Stream Corridor Restoration: Principles, Processes and Practices, 1998). Federal Interagency Stream Restoration Working Group (15 federal agencies) (FISRWG).

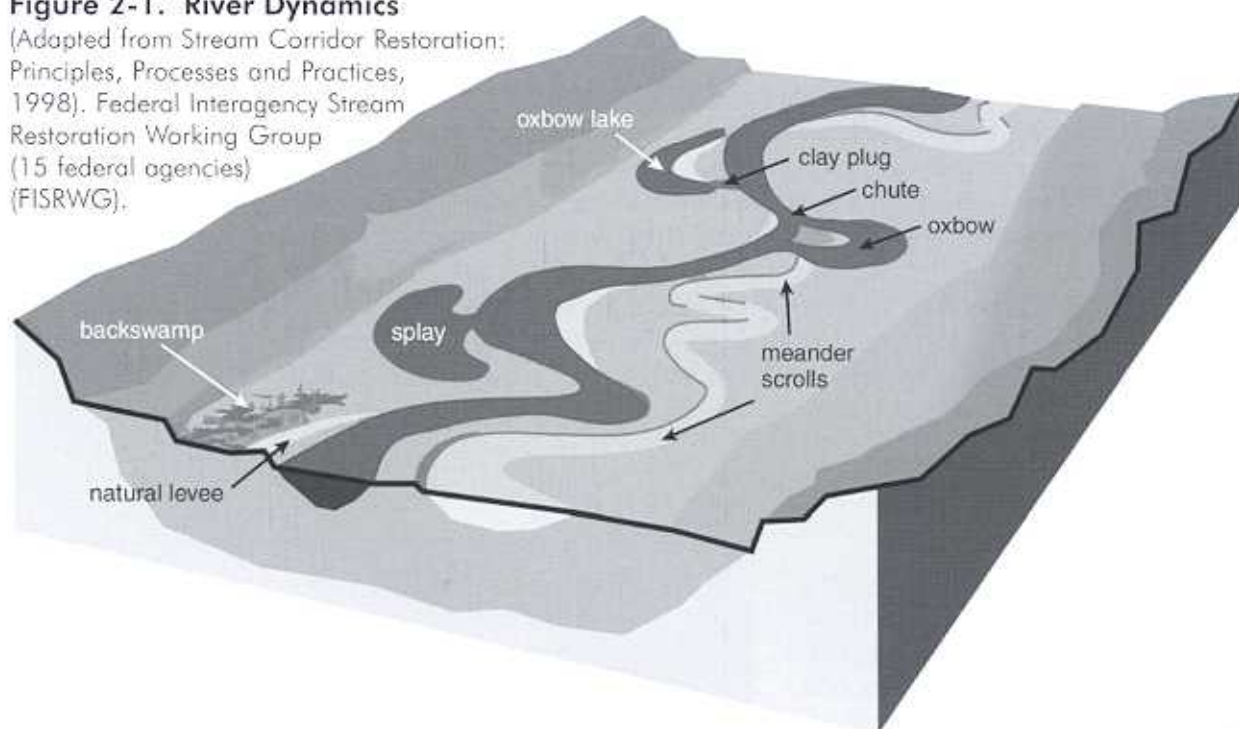
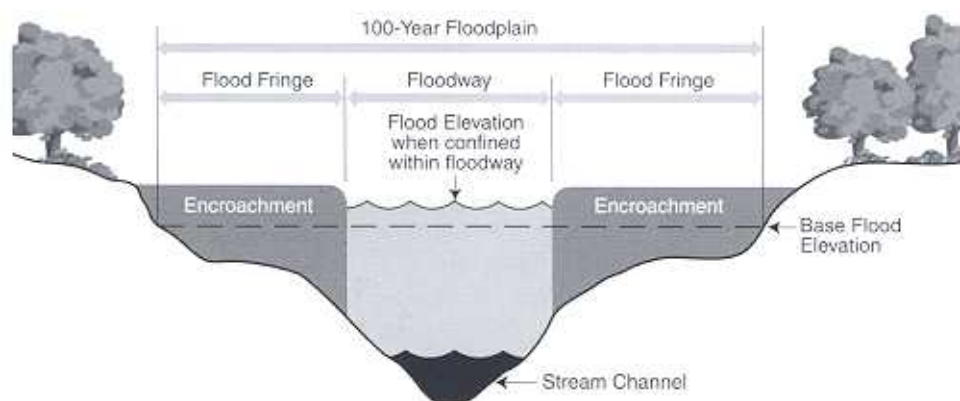


Figure 2-2. The Floodway



that area of the watercourse and adjacent floodplain necessary to carry the base flood without increasing the water surface elevation more than a designated amount (generally one foot). The base flood is the flood that has a one percent chance of being equaled or exceeded in a given year. Communities are required to prohibit development within the floodway that would cause an increase in flood heights. This requirement has the effect of limiting development in floodways that in turn helps to maintain some of the floodplain's most important natural resources and functions (Federal Interagency Floodplain Management Task Force, 1996).

2.1.2 Coastal Floodplains

Marshes, near shore ocean bottoms, beaches, salt ponds, tidal flats and estuaries are components of a complex coastal system. These areas provide habitat for marine and estuarine organisms, many of which are of significant ecological and economic value. Coastal beaches, dunes, tidal flats, salt marshes, banks and barrier islands play important roles in protecting landward areas from the destructive forces of storms. Apart from major storm events where waves may overrun entire areas, inundation follows a largely predictable tidal cycle in coastal systems. The specific characteristics of a coastal floodplain such as geographic location, contributing sediments and whether or not the floodplain has been modified or remains relatively pristine can greatly alter the way storms and resulting floodwaters will impact the area.

The configuration of a coastal floodplain is largely determined by underlying geology, sediment supply, and wind and wave energies. Sedimentary coastal floodplains, such as cobble, sand, and silt beaches adjust to storm energies during an extreme event and then rapidly readjust to normal patterns. Long term more permanent shoreline changes can result from changes in sediment supply, sea level rise, or changes in predominant wind and wave direction. The classic example of this long term change is the "rolling over" of a barrier island which migrates towards or away from the mainland over geologic time with changes in sea level and sediment supply.

Coastal floodplains are widely recognized for their importance to estuarine and marine fisheries. According to the Environmental Protection Agency (EPA), 96 percent of the commercial catch and over 50 percent of the recreational harvest in the southeastern United States are fish and shellfish that depend upon the estuary-coastal wetlands system. Estuarine wetlands serve as breeding, nursery and feeding grounds for estuarine and marine fisheries, while coastal floodplains are equally important to waterfowl, furbearers, and other wildlife species.

Shallow water habitat in estuaries, tidal rivers, and near beaches are significant areas for a variety of shellfish and finfish resources. The quality of water in areas containing shellfish is affected by alterations in sediments, salinity, dissolved oxygen, nutrients, turbidity, temperature and the addition of pollutants. Water circulation patterns are crucial in maintaining proper water quality characteristics necessary for productive shellfish beds. Water currents also supply nutrients and disperse pollutants. Only those creeks, ponds, lakes, rivers and streams that have an unimpeded connection to the sea may serve as a spawning area for

anadromous fish (ocean fish that migrate to fresh waters to spawn). These same watercourses also provide a migration route for catadromous fish (fish that spawn in the ocean but return to fresh water to reach adulthood). Dams without fish ladders are barriers to spawning migrations and are one of the leading factors in the demise of many anadromous/catadromous fish runs.

2.2 The Natural and Beneficial Functions of Floodplains



J. McShane

The Wekiva River, near Orlando, is a naturally functioning riverine/floodplain/wetland system that provides numerous benefits for the community.

Surface waters, their floodplains, and watersheds are viewed as parts of a broader, single system. This interaction of land and water exists in a state of dynamic equilibrium. If a component of the natural system is disturbed, the entire system works to readjust towards a new equilibrium. This is true of riverine and coastal systems alike. The effects of a system's readjustment are often felt far from the original site of the disturbance and can last for decades. The protection and restoration of floodplains must be undertaken with these important environmental and economic consequences in mind.

Floodplains perform a variety of essential functions including floodwater conveyance and storage, groundwater recharge, wave attenuation, stream bank erosion control, reduction in sedimentation rates, water quality maintenance, and support of highly productive ecosystems. Benefits to humans are also provided in the form of sites for various types of water dependent development and recreational opportunities as well as cultural and scientific values.

Over the past years there has been considerable discussion over how to categorize or describe the natural and beneficial functions of floodplains. At various times they have been called "values", "functions", and "resources." Early in its deliberations the Task Force determined that further efforts in this area were not productive. Regardless of what the functions are called the value to society is the same.

The 1994 revision to *A Unified Program for Floodplain Management* (Federal Interagency Floodplain Management Task Force, 1994) points out that relatively undisturbed floodplains or those that have been restored to a nearly natural state provide a wide range of benefits to both human and natural systems. Some of these benefits are static in nature (e.g., providing aesthetic pleasure) and some are dynamic processes (e.g., filtering nutrients). In that document floodplain resources and functions are categorized under the general headings of Water Resources, Biologic Resources and Societal Resources (see Table 2-1). Table 2-2 provides another example of how to characterize these functions that may be useful to the reader. (Source: *A Unified Program for Floodplain Management*, 1994)

Table 2-1. Natural Resources of Floodplains

Water Resources	Biologic Resources	Societal Resources
Natural Flood and Erosion Control <ul style="list-style-type: none"> - Provides flood storage and conveyance - Reduces flood velocities - Reduces peak floods - Reduces sedimentation 	Biological Productivity <ul style="list-style-type: none"> - Supports high rate of plant growth - Maintains biodiversity - Maintains integrity of ecosystem 	Harvest of Wild and Cultivated Product <ul style="list-style-type: none"> - Enhancement of agricultural lands - Provides sites for aquaculture - Restores and enhances forest lands
Water Quality Maintenance <ul style="list-style-type: none"> - Filters nutrients and impurities from runoff - Processes organic wastes - Moderates temperature fluctuations 	Fish and Wildlife Habitats <ul style="list-style-type: none"> - Provides breeding and feeding grounds - Provides and enhances waterfowl habitat - Protects habitats for rare, threatened or endangered species 	Recreational Opportunities <ul style="list-style-type: none"> - Provides areas of active and passive use - Provides open spaces - Provides aesthetic pleasure
Groundwater Recharge <ul style="list-style-type: none"> - Promotes infiltration and aquifer recharge - Reduces frequency and duration of low flows 		Areas for Scientific Study/Education <ul style="list-style-type: none"> - Cultural resources (historical/archaeological) - Opportunities for environmental, biological, or other studies

Regardless of how the natural and beneficial functions of floodplains are characterized, floodplains in a natural or relatively undisturbed state function as they do because of their unique geomorphology. Their position in the landscape and their association with water makes them among the most geologically dynamic and biologically productive areas in a watershed, resulting in functions that are interrelated and inseparable. These areas reduce flood losses as a result of their landscape position as well as the natural properties they possess, constituting the "natural infrastructure" that performs a variety of functions in the floodplain environment (Federal Interagency Floodplain Management Task Force, 1996).

2.2.1 Water Resources Functions

Floodplains help protect and restore the physical, chemical and biologic integrity of our nation's waters. Flood conveyance and floodwater storage are among the primary natural functions of floodplains. Hydrology is the dominant characteristic of floodplains that drives the dynamics of the entire system. Floodplains receive and store water from 1) excess stream flow that exceeds the ca-

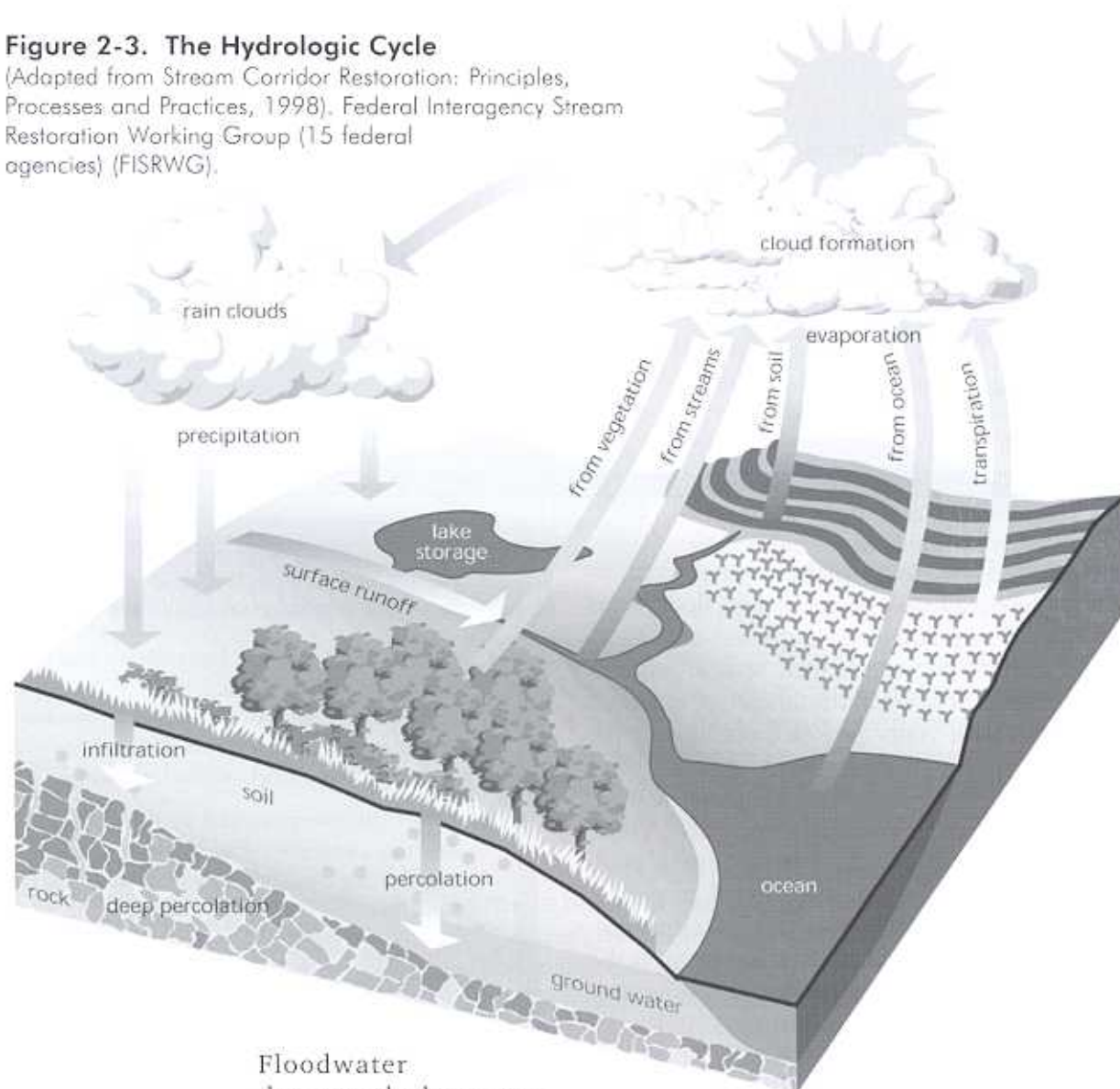
Table 2-2. The Characteristics and Processes of Floodplains

- Floodplains have the capacity to store and convey floodwaters, thus diminishing floodwater velocities and resulting in the reduction of flood damages and flood related erosion.
- Soil fertility is increased as floodplains naturally replenish the nutrients of the surrounding soils during periodic inundation.
- Floodplains improve water quality and quantity by providing areas of groundwater recharge, while also filtering impurities and nutrients.
- Floodplains enhance biodiversity, providing breeding and feeding grounds for fish and a wide variety of wildlife including endangered species.
- Floodplains contain immense agricultural and forestry resources.
- Society benefits from the aesthetic value and recreational uses that floodplains can provide.

capacity of the channel, 2) surface runoff from the surrounding watershed, and 3) direct precipitation (Figure 2-3). The generally flat nature of natural floodplains is favorable for local ponding and flood detention, and the permeable nature of alluvial soils promotes infiltration into the subsurface for storage in soils and aquifers.

Figure 2-3. The Hydrologic Cycle

(Adapted from Stream Corridor Restoration: Principles, Processes and Practices, 1998). Federal Interagency Stream Restoration Working Group (15 federal agencies) (FISRWG).



Floodwater that exceeds the conveyance capacity of the waterway is stored in floodplains for varying periods of time after a precipitation event and flows to the watercourse gradually, either as surface or subsurface (groundwater discharge) flow. The floodplain's natural capacity for flood storage and conveyance serves to reduce flood velocities and peak flows in the stream channel. Floodplain vegetation also plays an important role in determining the flow patterns and the velocity at which water flows across the land. Except in narrow, steep valleys and areas of coastal bluffs, floodplains provide an expansive area where floodwaters can slow in velocity and disperse over a broader area. Decreased

velocities can increase the “lag time” of a flood (i.e., the time between the middle of the rainfall event and the flood peak), and minimizes the magnitude of flooding and the potential for flood-related damage. Additionally, decreasing floodwater velocities will reduce erosion and subsequent sedimentation in other areas such as the stream channel.

This ground water/surface water interaction helps to naturally regulate flow regimes of rivers, streams, and lakes. During periods of abundant flow, water enters the groundwater system rather than contributing to seasonal flood peaks. Diminishing extreme variations in flow levels improves the capacity of the water body to support a diversity of wildlife, to provide recreational benefits, in addition to contributing to the reduction of flood peaks.

Water entering a floodplain carries sediments of various types, sizes and amounts. Sediments added to the system from upstream and from the surrounding watershed are transported downstream and deposited in floodplains and watercourses. Erosion can increase sedimentation in streams, rivers, and lakes. Turbidity and sedimentation degrade water quality, raise water temperature, slow conveyance rates, and increase floodwater heights. A corresponding decline in the usefulness and value of the water resource is often the end result.

Vegetated floodplains control erosion and sedimentation of streams and other water bodies by stabilizing riverbanks and filtering run-off. Water is naturally cleansed through the processes of filtration, ion exchange, adsorption, absorption, and aerobic biological actions that take place in the floodplain. These natural processes reduce the levels of pathogens and toxic substances that enter the water body, while at the same time retaining the nutrients within the floodplain soils. Vegetative floodplains also protect waterways, wetland areas, and riparian zones from excessive erosion and sedimentation by slowing the velocity of stormwater, allowing for the deposition of sediments on land and by binding the soil.

2.2.2 Ecological Functions

The nation's coastal and riverine floodplains support and promote biological productivity and often contain large and diverse populations of plants and animals contributing to the diversity and integrity of adjacent and downstream ecosystems. Nutrients and energy that enter rivers and streams are carried downstream into larger water bodies. Many plant species indigenous to floodplains are adapted to thrive in the specific conditions created by the soil types and water regimes that characterize river corridors. Floodplains may contain the only suitable environment for growth of some species of vegetation significant vegetation and for the breeding/spawning of many species of fish and wildlife. Riparian habitats are among the most important vegetative communities for western wildlife species (U.S. Fish and Wildlife Service, 1997).



NOVA Development

Vegetated floodplains control erosion and sedimentation of streams and other water bodies by stabilizing riverbanks and filtering run-off.

Floodplain Vegetation

The diverse vegetation in floodplains provides habitat for wildlife, controls erosion and sedimentation, and improves water quality by filtering pollutants. Floodplains often contain different zones of vegetation, with shallow aquatic vegetation changing gradually to trees and shrubs in upland areas. The diverse vegetation of floodplains can support a wide variety of wildlife and smaller organisms feeding on plants. Trees and shrubs in more upland areas provide food, protection, nesting and roosting areas for many species. In addition, fallen branches and root masses create macro- and micro-habitats among the pools, breaks, and riffles in the stream (Interagency Floodplain Management Task Force, 1996). The shading effect of riparian vegetation is beneficial for avoiding temperature extremes that stress natural biota. The warming of surface water due to the removal of streamside vegetation also lowers dissolved oxygen levels in the water, making it more difficult for aquatic species to migrate, reproduce or fulfill their expected life cycles.

In coastal systems and around large lakes, vegetated floodplains and dunes reduce wave heights and velocities from hurricanes, coastal storms, and thunderstorms. This reduces flood and erosion damage to critical areas and structures located within flood hazard areas.

Wetlands

Wetlands are important components of the floodplain environment that provide numerous biological, environmental and economic benefits. Wetlands act as a natural buffer against flooding by storing and slowly releasing floodwaters. Wetlands also protect water quality by filtering pollutants and sediments from surface runoff.

Wetlands are highly productive ecosystems that are often essential for maintaining biodiversity within a watershed. Wetlands provide habitats for fish, shellfish,

waterfowl and a wide variety of other aquatic and semi-aquatic species. The U.S. Fish and Wildlife Service estimates that up to 60 to 70 percent of threatened and endangered animal species rely on wetlands for habitat (Federal Interagency Stream Restoration Working Group, 1998).

Wetlands are being destroyed or converted to other uses at an alarming rate. According to estimates by the U.S. Fish and Wildlife Service, 53 percent (117 million acres) of



"The Great Florida Marsh" by Martin J. Heade. Even in the nineteenth century, there were people who appreciated wetlands for their aesthetic and other values.

the wetlands in the lower 48 States were lost between the 1780's and the 1980's. As of the 1997, only about 105.5 million acres remained in the lower 48 States, representing about 5.5 percent of the landmass of the continental United States (Dahl, 2000). This loss of wetlands has increased flooding in many parts of the country. In its report on the Midwest Flood of 1993, the Interagency Floodplain Management Review Committee (1994) noted that upland watershed treatment and restoration of upland and bottomland wetlands can reduce flood stages in more frequent floods (25 years or less).

2.2.3 Functions of Coastal Floodplains

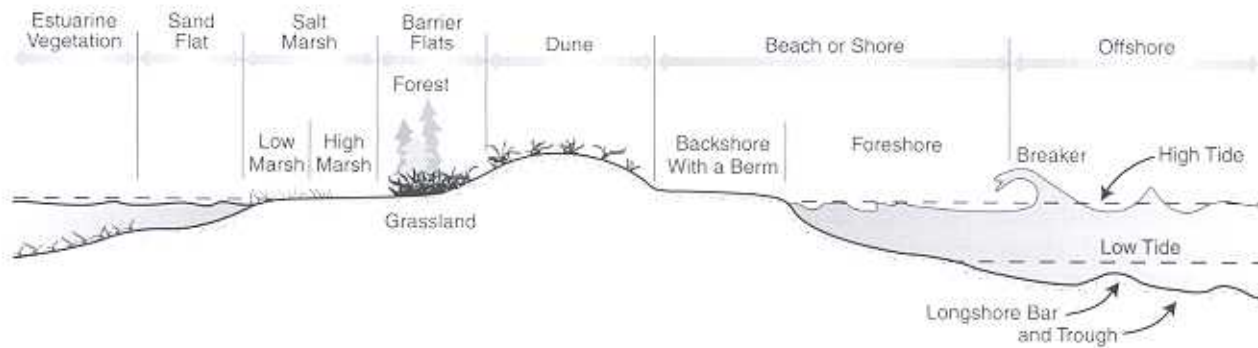
The most critical function of any coastal floodplain is the protection and maintenance of the resources that exist along both the shores and inland. These resources include nearby mainland beaches, barrier islands, rocky intertidal shores, salt marshes, and wetlands, and encompass a wide range of wildlife species. Also included are humans and human elements such as housing, roads, etc. Coastal floodplains are natural resources that must be properly managed in order to protect the shorelines, low-lying inland areas and the species these areas support. Coastal zones are extremely dynamic areas due to the abundance of wind and wave energy and dependence on coastal sediments. Coastal environments tend to change at a fairly constant rate over time, but in the short run hurricanes, seasonal storms, excessive winds and tidal extremes can easily accelerate these changes and result in severe storm damage and floods. Predicted increases in the rate of sea level rise will only increase the susceptibility of coastal areas to flood losses.

The coast's primary defense against wave energy is shallow near shore ocean bottoms. Waves are formed by the wind and refraction alters their form and direction. These waves often break before striking the shore, thus diminishing their stored energy. The coast's secondary response to wave energy is provided by coastal beaches, which under ordinary conditions absorb much of the incoming wave energy.

Energy-intensive storm waves cause beach sediment to move offshore to subtidal areas, resulting in a reduced coastal beach volume and a gentler slope. Coastal dunes on barrier islands constitute the major portion of the total volume of a barrier island that is visible above high water. On retreating shorelines the coastal dunes bordering the beach migrate landward, either over a gradual period of time from tidal and wave influences, or very rapidly, as in the event of a major storm. The erosion of coastal dunes by waves, usually during storms, supplies sand to the adjacent coastal beaches or shallow waters. Without this supply of sediment, beaches will gradually be depleted, either migrating or disappearing from the onshore sediment system. The volume (height and width) and form of coastal dunes provides a buffer that resists wave run-up during storms and retards shoreline retreat. Vegetation contributes to the growth and stability of coastal dunes by providing conditions favorable to sand deposition and stability.

What is often thought of as shore "protection" or "stabilization" can create adverse effects upon the functionality of coastal zones. The implementation of hard or soft structures (e.g., seawalls, jetties, sandbags, man-made beaches of littoral fill) can either directly or indirectly alter the natural processes that serve

Figure 2-4. Barrier Island and Barrier Beach Dynamics



Barrier islands and coastal floodplains play an important role in reducing flood damages by absorbing and dissipating wave energy and storm surges.

as protection against flooding and storm damage. Coastal sediments tend to function on a budget system. For example, when sediment is removed from a given location it often causes soils to begin accumulating rather unpredictably in another locale. The budget system also works in a reverse manner. If sediments are accumulating in one location, it means they are being removed from elsewhere in the system. In an attempt to regain equilibrium the coastal sediments will continue to shift, eroding from one area only to be deposited in another. When dredging or filling within coastal floodplains or coastal

estuaries, inlets, or wetlands occurs, the natural processes that play an instrumental role in storm damage prevention and flood control may become compromised.

Barrier islands and coastal banks play an important role in storm damage prevention and flood control. Barrier islands provide one of the strongest coastal defenses against shoreline erosion through their natural processes of "roll" and migration. Barrier islands hinder wave action and storm overwashes. Coastal banks have the ability to adjust in response to wave action, which allows them to supply sediment to coastal beaches, coastal dunes, barrier beaches and land under the ocean. They also provide a natural resistance to erosion caused by wind and rain runoff, acting as a vertical buffer to storm waters and waves.

Rocky intertidal shores act in much the same manner as coastal beaches. The sloping shore and/or boulders dissipate wave energy and serve as natural buffers from the sea for the land behind the rocky intertidal shore. Rocky intertidal shores also play an important role in the protection of fish and shellfish.

Marshes are recognized for their importance as habitat for marine fish and shellfish. Salt marshes are extremely productive natural systems and a source of

large volumes of organic material (detritus) for the ocean and estuaries where it supports extensive marine food chains. The chemical characteristics of estuarine waters, particularly the levels of nutrients, dissolved oxygen and biological oxygen demand, are modified each time estuarine waters flush a salt marsh area. Salt marshes act to reduce pollution of the coastal zone by removing excess nutrients and heavy metals delivered by surface runoff from upland areas.

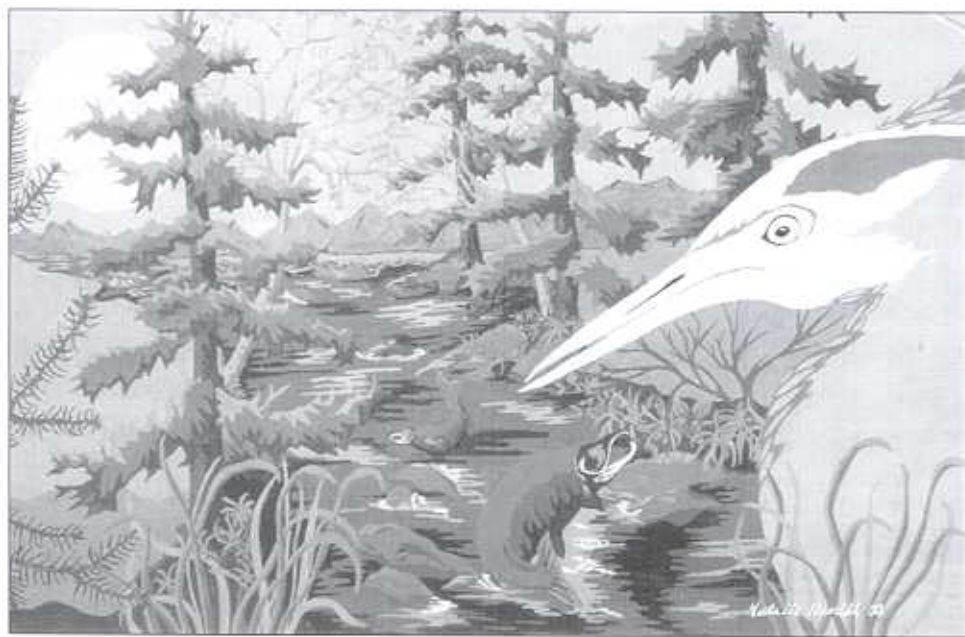
Marshes also play an important role in storm damage prevention and ground-water supply. Marsh vegetation and underlying peat are resistant to erosion and dissipate wave energy, thus providing another coastal zone defense against wave damage. The properties of marshes both slow water and spread it out during periods of inundation until it gradually flows back to the sea or estuary.

2.3 Human Values of Floodplains

In addition to the natural functions, floodplains provide values to humans that enable society to enjoy and interact with their natural surroundings. Floodplains provide cultural, educational, recreational, and scenic values that extend beyond a specific floodplain to enrich communities along entire rivers and coasts. In some areas, floodplain lands constitute the only public land base available to nearby residents for passive and active recreation.

Floodplains contain cultural resources important to the nation and to individual localities. Native American settlements and early cities located along the coasts and rivers for access to water supply, waste disposal, water transportation, and trade. Due to their flat topography, floodplains often were travel corridors for human movement, providing the easiest, if not the only, access to other areas, particularly in and through mountainous terrain. Consequently, floodplains include many of the nation's earliest archaeological and historical sites. In addition to their historical richness, floodplains contain invaluable resources for scientific research. Floodplains can serve as nature study centers and laboratories for outdoor learning experiences.

Due to their scenic value and recreation opportunities, floodplains are ideal locations for parks and nu-



"All Paths Lead to Light" by Natalie Hamill, age 17, Stuart Country Day School, New Jersey. 2000 National Art Finalist, River of Words Contest®. Schoolchildren around the country are learning to explore and value the natural world through the annual River of Words Watershed Poetry and Art Contest, which is affiliated with the Library of Congress Center for the Book.

©River of Words

merous outdoor activities, such as water-oriented sports, boating, swimming, hiking and camping. Floodplain wildlife resources can be managed for observation as well as for recreational hunting and fishing. Finally, natural floodplains can be valuable as constituents of the “wilderness experience,” an important aspect of American culture.

To understand and appreciate floodplain functions and values, one must look beyond a specific point in a floodplain to the overall ecosystem that encompasses numerous natural and human communities. As such, most of the natural ecological, water, recreational, and cultural values of floodplains discussed above do not benefit just one specific site, but rather an entire river system or coastal landscape. Effective management of these resources can ensure that both human and natural communities receive the benefits of a balanced and vigorous floodplain system.

Humans have always been attracted to floodplains because of their many sustaining attributes: fresh waters, rich diversity of fish and game resources, fertile soils, level terrain and their proximity to waterways. Activities such as agriculture, forestry, and industrial, commercial and residential development have historically thrived in floodplains. These activities have altered the landscape and adversely impacted the natural functions of floodplains. Only recently have we begun to understand the adverse effects that years of human development and industrialization have had upon floodplains. These adverse effects include decreases in water quality, loss of wildlife habitats, and an increase in the frequency and severity of catastrophic flood losses. Through an understanding of our impacts upon floodplains and of the economic and environmental benefits of floodplains, can we formulate better floodplain management approaches that will better protect the floodplain's natural and beneficial functions.

Section Three **THE IMPACT OF HUMAN ACTIVITIES ON FLOODPLAINS**

3.1 Impacts of Flood Control and Other Water Resources Structures

Although the Task Force recognizes that many flood control and other water resources structures provide valuable benefits to society in the form of flood control, water supply, power, and recreation, these structures can have significant impacts on the natural floodplain and on natural and beneficial floodplain functions including reducing flood velocities and peak flows. Less intrusive solutions can sometimes achieve these same benefits without the loss of floodplain resources and functions.

Channelization and Diversions

Channelization is the process of deepening, straightening, and/or widening a waterway for the purpose of moving high water flows quickly downstream to prevent over bank flooding of adjacent lands. Channel deepening and straightening is also done to improve navigation. Channelization can reduce flooding in the immediate area of the channel, but can also aggravate flood heights and velocities, and erosion downstream. Channelization can also eliminate or reduce floodplain functions by lowering water levels, effectively disconnecting the floodplain from the stream, reducing the retention of water in wetlands, decreasing habitat diversity, and destroying riparian vegetation. Construction usually requires the clearing of vegetation to allow access for equipment to excavate and maintain the channel.

Diversions, which are particularly common in the West, are open or closed channels used to transfer water from a water body to a new location for use in industry, agriculture, or for domestic consumption. Many state policies on agricultural diversion practices require that specified amounts of flow be maintained in the channel or that the diverted water be returned to the stream or river after use in order to prevent the



Channelizing streams can reduce flooding in the immediate area of the channel, but it often increases flood heights and erosion downstream. Stream channelization also degrades water quality, destroys habitats for fish and wildlife, and adversely impacts the natural functioning of the stream and its floodplain.

destruction of instream and floodplain habitat. This process can help preserve floodplain functions that depend on the timing and quantity of water diverted (e.g., waterfowl habitat, fisheries, and water recreation).

Dams and Reservoirs

Dams create impoundments of water for use in the generation of hydroelectric power, irrigation, water supply, and flood damage reduction. Well-sited and properly managed dams can limit flood losses and some of the adverse impacts on the functions of floodplains. Dams can store and release water in reservoirs on a controlled basis, thus limiting the occurrence of downstream flooding and minimizing erosion over that which may have occurred during high flows before the dam was constructed. Reservoirs can also provide additional benefits, such as recreation and warm water fisheries.

However, dams can have dramatic impacts on river systems. Stream and terrestrial habitat and associated resources are lost due to inundation by the impoundment. Dams and reservoirs can impede the flow of rivers, reduce or eliminate the beneficial periodic inundation of natural floodplains, and block or slow the passage and migration of aquatic organisms. Dams can result in the long-term loss of diversity, and adversely impact stream habitat, aquatic resources and other functions. This in turn affects food chains associated with floodplain functions, and alters the size and diversity of wildlife populations.

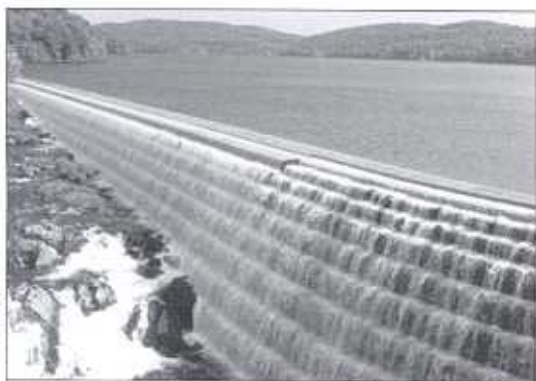
Dams can also alter water quality by changing the normal temperature of the body of water, consequently affecting the biological conditions necessary for feeding or reproduction.

Dams can block sediment transport which affects the volume and water quality in the reservoir and can cause scouring downstream until an equilibrium bed load is reestablished (Interagency Stream Restoration Working Group, 1998). This can also reduce the sand supply in coastal systems increasing coastal erosion and resulting storm damages. Finally, dams can create a false sense of security from flooding that leads to increased development below the dam.

Levees, Dikes and Floodwalls

Levees, dikes and floodwalls can provide flood protection from seasonal or sporadic flooding, and are often used in conjunction with other types of channel modifications. Construction usually requires the clearing of vegetation to allow earth-moving equipment access for excavation and placement of the embankment. After construction, side slopes are often seeded or sodded, and vegetation is maintained to avoid conditions that might endanger the levee's structural integrity during flood events.

Levees, dikes and floodwalls often have similar impacts on the floodplain as channelization. Levee systems create drier conditions on the protected floodplain, which may have adverse impacts on the spawning success of many fish species, and contributes to the loss of wetlands. Levees also typically raise the water surface elevation on the riverward side during flood conditions, causing further inundation that can lead to soil, vegetation and habitat loss (USACE,



J. McShane

Dams can adversely impact floodplain natural resources and functions by inundating floodplains and by changing downstream flow regimes.

1989). In some instances improperly designed levees can increase upstream or downstream flooding. In addition, levees may create a false sense of security from flooding that leads to increase development behind the levee.

However, if the natural channel is unaltered and some riparian habitat is preserved between the levees, then the adverse effect on habitats can be minimized, and the impact associated with levees is reduced.

Dredging and Excavation

The dredging and excavation of streams is often implemented to straighten, enlarge, or increase the flow capacity or navigability of a channel. In addition, adjacent areas are often graded and fill is placed to prepare sites for development. Improper dredging may destroy habitat, effectively reducing the assimilative capacity of small order streams and riparian areas. Drainage changes and the lowering of the water table associated with dredge and fill activities in the floodplain can have an adverse effect on adjacent wetlands and other natural values of floodplains such as floodwater storage, runoff prevention, water filtration and erosion control (USACE, 1994; 1989).



USACE

Levees and floodwalls typically require the removal of riparian vegetation and cut the river off from its historic floodplain.

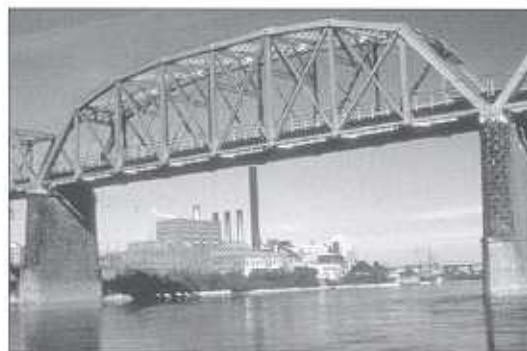
3.2 Impacts of Changes in Land Use

Urbanization and other changes in the use of land and how it is managed that occur in and outside of the floodplain also have significant impacts on the natural floodplain and on natural and beneficial floodplain functions. Economic and societal benefits from floodplain development must be balanced against the impacts of the development on the environment and its susceptibility to flood damages. By improving our understanding of natural and beneficial functions of the floodplain we can learn to design or modify changes in land use to avoid or minimize these adverse impacts.

Urbanization

Development within watersheds and floodplains can alter the floodplain landscape and adversely affect the natural functions of floodplains. Urbanization often replaces natural vegetation with impervious surfaces, such as buildings, streets and parking lots. Impervious surfaces increase runoff, which results in reducing lag times and increasing velocities, and ultimately can lead to more severe flooding downstream. Extensive filling of the floodplain, which is often related to urbanization, removes the flood storage capacity and blocks the natural conveyance properties of floodplains, and leads to increase flooding.

Loss of vegetation and excessive runoff can increase erosion and sedimentation that may fill channels, cover fish spawning areas and bury food sources within streams, and increase flood



USACE/Washington

One way that urbanization alters the floodplain landscape and functions is that it presents a threat to water quality of waterways through non-point source and point source pollution.

magnitude and frequency. Vegetation loss also affects wildlife habitats by removing cover, reducing the filtration of pollutants, and raising the surface water temperature. Additionally, man-made structures present barriers to species migration and reproductive success.

Urbanization presents a threat to water quality of waterways through non-point source and point-source pollution. Non-point source pollution includes agricultural runoff, fertilizers, and failed septic systems. Point source pollution includes sewage treatment plants, industrial disposal discharges, and leached materials from waste disposal areas.

Mining

Many mining techniques utilized over the past century, such as sand and gravel operations, strip mining, open-pit operations, and dredging have left streams throughout the United States severely degraded. Placement of spoil from mining operations or temporary storage of the mined materials may reduce floodplain conveyance and storage and adversely impact other natural and beneficial floodplain functions. Mining in the stream channel may increase headcutting and degrade water quality. Contamination from surface mining may change the hydrologic, physical, chemical, and biological conditions of streams and rivers. Toxicity loads may be increased to the point where the water chemistry is significantly altered, in some cases creating sterile environments.

Agriculture & Forestry

The level terrain, fertile soils, and proximity to water make floodplains attractive land for agriculture and forestry. Properly managed agriculture and forestry can provide environmental and economical uses while maintaining the natural functions of floodplains. Agriculture and forestry can provide beneficial vegetative cover that maintains the flood conveyance and storage capacity of the floodplain, limits erosion and runoff, and provides habitats for wildlife species. Conversely, if not properly managed, some forms of agriculture and forestry can severely impact the floodplain environment.

Environmental damage can occur if agriculture is attempted in floodplains with unsuitable conditions or if best management practices are not followed. Crops that are unsuited to arid environments and poor soils can require large amounts of water and application of harmful chemicals. These excessive watering practices can lead to increased erosion and runoff of fertilizers. Lack of crop rotation or cultivation of crops on steep slopes at the edge of the floodplain can lead to excess erosion.

One of the most significant impacts related to agriculture is the removal of native vegetation and vegetated buffer areas to increase available fertile land. Removing the riparian buffer zones can increase erosion and sedimentation, increase the transport of contaminants and nutrients, and impair or destroy natural habitat. Conversely, preservation of these buffer areas can provide significant protection to the natural and beneficial functions of the floodplain.

Agricultural tillage and soil compaction can increase surface runoff and decrease the soil's capacity to hold water. Irrigation and drainage practices can



Placement of spoil from mining operations may reduce floodplain conveyance and storage, and impact water quality through the addition of sediment and chemicals.

diminish aquifer recharge areas, lower water tables, and add pollutants to potable water supplies. Over-grazing by domestic livestock can trample and devegetate floodplain areas, effectively removing vegetative cover in riparian areas.

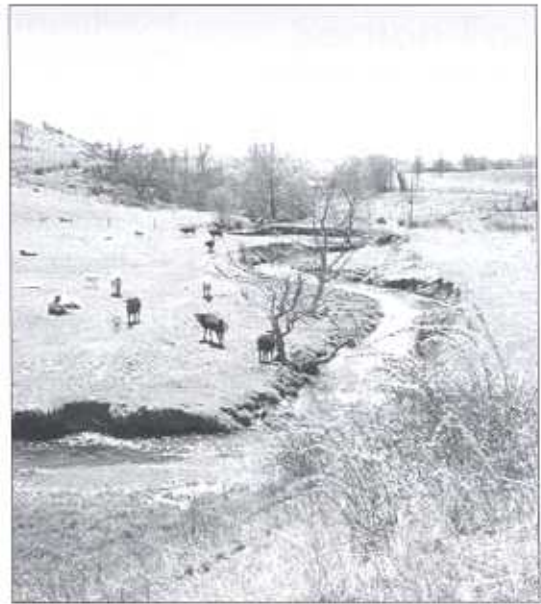
Inappropriately managed forestry practices can also eliminate valuable floodplain resources and adversely affect floodplain processes. Tree removal practices such as clear cutting can either overload or decrease the quantity of nutrients in the watershed, which can affect the quality, quantity, and timing of stream flows. Removal of shade trees adjacent to the waterway can increase water temperatures and reduce available habitat for fish and wildlife. Clearcutting and the construction of roads related to forestry can expose, remove or compress soils, leading to increased runoff and erosion, resulting in the siltation of streams.

Introduction of Exotic Species

Exotic plant and animal species may be introduced into floodplain systems by a variety of mechanisms from surrounding residential and agricultural areas. Exotic plant species may be intentionally introduced through horticulture practices or inadvertently introduced through other human activities. Exotic species that prove to be invasive can disrupt floodplain ecosystems increasing competition of indigenous plants for moisture, sunlight, and space and by changing the structure of native plant communities. This change in structure can supersede natural plant cover, eliminate or reduce the quality of food sources and cover for indigenous animal species, disrupt the food chain and adversely affect endangered species by changing the components of their existing habitat. Exotic plants that are introduced but do not become invasive, can be vectors for other species (insects, microorganisms, and other plants) that can become invasive. Invasive aquatic organisms that are introduced into a stream or river can radically affect the floodplain food web and have other detrimental affects as well. Since habitat disturbance can facilitate the introduction or spread of invasive species, a naturally functioning floodplain may prove to be more resistant to the establishment of many non-native species. Therefore, protecting and restoring natural floodplain functions in conjunction with aggressive eradication programs can help maintain the native flora and fauna populations and the viability of the floodplain ecosystem. Many exotic species are capable of exploiting newly restored habitats to the detriment of native species. Therefore, restoration should be approached carefully in the context of clear resource management objectives.

Recreation

The flat terrain, proximity to water, and scenic vistas provide abundant recreational opportunities in floodplains. The impacts of recreation on the floodplain environment depend largely upon the characteristics of the floodplain (i.e., vegetation, soils), and the type and intensity of the recreational use. For example, a recreational trail in the floodplain can have little impact if the important functions of the floodplain are recognized and preserved. Well-planned parks or



USFWS

Over-grazing by domestic livestock can trample and devegetate floodplain areas, effectively removing vegetative cover in riparian areas.

recreation areas that include indigenous vegetation and maintain flood storage capacity can support the floodplain functions that protect water quality and sustain habitats for diverse wildlife species. Conversely, some forms of intensive recreation can have similar adverse impacts on natural and beneficial functions of floodplains as other forms of urban development. Uncontrolled use of off-road and all-terrain vehicles can cause significant compaction of soils and loss of vegetation. The use of motorboats can disrupt bottom sediments, increase shoreline erosion and create gas and noise pollution.

Human development and other activities have caused significant adverse effects to the natural resources and functions of floodplains. The recommendations provided in this report can limit these impacts in the short-term, and protect and restore valuable floodplain resources and functions in the long-term.



The important functions of the floodplain have been recognized and preserved at the Tidewater Trail in San Francisco Bay National Wildlife Refuge.

4.1 The Current State of Floodplain Management

Flood damage reduction in the United States has historically consisted of structural measures, such as dams, reservoirs, levees, and channelization that alter the location, depth, and duration of floodwaters. Although a significant portion of Federal, State and local money is allocated to the implementation of structural measures, the approach to flood damage reduction is shifting. As the awareness of increased costs and the environmental implications grows, greater consideration is being given to alternative solutions and implementation of non-structural measures is increasing. In addition, floodplain managers and other stakeholders are realizing that implementation of non-structural measures often maintains or even restores the natural functions of the floodplain, in addition to reducing flood losses.

Non-structural approaches to reducing flood losses modify the *susceptibility* to flooding (e.g., removing a building from the flood hazard), instead of attempting to control floodwaters. Non-structural floodplain management alternatives include the regulation of new floodplain development by states and communities; the acquisition, relocation, elevation, and floodproofing of existing floodprone structures; land easements and acquisitions; restoration of wetlands; and land and watershed management. Non-structural approaches may also include the use of some structural elements, such as creating a detention pond.

This section discusses a number of current government programs dealing with floodplain management and identifies some of the challenges and remaining barriers to protecting and restoring the natural and beneficial functions of floodplains. It also references Case Studies (located in Appendix B), which illustrate successful Federal, State and local approaches to floodplain management. In addition, Appendix A provides a more comprehensive description of governmental programs related to floodplains, their resources, and management.

Federal Efforts

During the past 30 years, some Federal, State, and local agencies have supported the gradual shift to non-structural flood damage reduction and the restoration and protection of floodplains with a variety of programs and approaches. Over this same time period, technical advances, particularly in mapping and other data gathering, have improved the capability of government at all levels to undertake actions in support of the maintenance and restoration of natural and beneficial functions of floodplains. Public education programs have been initiated, environmental awareness increased, and resource protection programs implemented across the nation. These programs and initiatives have helped to make flood loss reduction and the protection and enhancement of the natural functions of the floodplain a unified objective. (*See Case Study – Napa Creek Flood Protection Project, Napa Valley, California*).

Examples of Federal efforts that involve the protection and restoration of the natural functions of floodplains include:

- The issuance and implementation by Federal agencies of *Executive Order 11988, Floodplain Management*, and *Executive Order 11990, Protection of Wetlands*

Section Four THE CURRENT STATE OF FLOODPLAIN MANAGEMENT AND CHALLENGES TO POLICY MAKERS

- Public land planning and management by agencies (e.g., the U.S. Forest Service, Bureau of Land Management, National Park Service, and Fish and Wildlife Service) who administer programs with floodplain, wetland, and riparian components (e.g., the Natural Resources Conservation Service's Wetland Reserve Program)
- Mapping and information gathering (e.g., FEMA's flood hazard mapping and the National Wetlands Inventory)
- Enrollment of communities into the National Flood Insurance Program (NFIP)
- The regulatory permitting process pursuant to Section 10 of the Rivers and harbors Act of 1899 and Section 404 of the Clean Water Act of 1977 (activities in navigable waters and the discharge of dredged or fill material into wetlands and other waters of the United States)
- Technical assistance programs for State and local governments and private landowners (e.g., U.S. Fish and Wildlife Service Partners for Fish and Wildlife Program)
- Reviews of proposed projects under the National Environmental Policy Act

Some of the Federal Laws and Policy Initiatives Affecting Floodplains

- Executive Order 11888, Floodplain Management (1977)
- Executive Order 11990, Wetlands Protection (1977)
- Federal Public Land Planning Initiatives
- Fish and Wildlife Coordination Act of 1958
- National Flood Insurance Act of 1968
- National Environmental Policy Act of 1969
- Clean Water Act of 1972
- Water Resources Development Acts
- Water Quality Standards
- No Net Loss of Wetlands Policy
- Clean Water Action Plan (1998)

Other Federal, State, and local programs are showing initiative in protecting the natural and beneficial functions of floodplains. For example, the restoration of wetlands, riparian areas, riverbanks, and broader floodplains is taking place at thousands of sites throughout the nation. This is occurring under the 1996 Farm Bill Programs; the U.S. Army Corps of Engineers (USACE) 1135 program and other USACE authorities; FEMA's Hazard Mitigation Grant Program and other mitigation efforts; the U.S. Fish and Wildlife Service's (USFWS) Coastal Programs; and other related endeavors. New efforts recently authorized, such as the USACE's Challenge 21 Program, focus on reducing flood losses, while emphasizing non-structural measures and the protection and restoration of the natural resources and functions of floodplains. Hundreds of local governments across the nation are using these programs to take positive steps toward floodplain restoration through development and implementation of "greenway" programs. Many agencies at all organization levels are increasingly entering into partnership to achieve these goals. *(See Appendix A for an in depth discussion of these and other Federal laws, programs and initiatives that can support protection of the natural and beneficial functions of floodplains.)*

"Sustainable development" – a term that has been used for more than a decade – refers to the coordination and integration of policies on economic growth that will benefit present and future generations without detrimentally affecting the

resources or biological systems of the planet. Public awareness of sustainability, and "smart growth" has increased considerably in the past few years through the efforts of many organizations, including the President's Council on Sustainable Development. From this awareness, a number of approaches to controlled growth and sustainable development were created, including floodplain management and other vital natural resource protection initiatives. These initiatives incorporate resource sensitivity into community planning efforts and as such, directly support the protection and restoration of floodplain functions. (See Case Study – Sustainable Development in Del Rio, Texas.)

State and Local Efforts

Approximately one half of the states have adopted some form of floodplain regulations. Some states establish minimum standards for the regulation of floodplains through their local governments, while other states provide only technical assistance and oversight, with no formal floodplain management mandates in place. At the State and local level, a broad array of public planning and regulatory programs governing water, floodplain management, shoreline management, coastal zone management, "critical areas," and wetlands have been implemented. Resource protection efforts have also been implemented at the local level, including floodplain zoning, wetland protection, preserving agricultural land, stream buffers, greenways, conservation zones, and others. (See Case Study – Santa Clara River Enhancement and Management Plan.)

State governments generally have delegated most land use planning and zoning authority to local governments. Local planning and zoning allows for community-specific and realistic implementation of floodplain protection and restoration efforts. A locality can also use tools such as land and water planning, zoning and other regulations, public land management, infrastructure planning and tax incentives to implement a comprehensive multi-objective approach to meeting their resource planning goals. More than 19,000 communities across the United States have adopted floodplain regulations that at least meet the minimum requirements of the National Flood Insurance Program (NFIP). Many local governments have adopted comprehensive plans and broader zoning regulations. (See Case Study – 1999 Property Acquisition Project, City of Merriam/Johnson County).

Local governments are supplementing plans and regulations with non-regulatory measures. Many all mid-size and large cities have adopted greenway programs for a portion or all of their rivers and streams (e.g., Baltimore, Minneapolis, Denver, St. Louis, Boston, Washington DC). These programs involve land acquisition, construction of trails and parks, urban redevelopment, and wetland and floodplain restoration. In addition, over 5,000 local governments have adopted their own wetland regulations. Many of these regulations apply to wetland portions of the floodplain as well as wetland areas elsewhere in the community. Most local wetland regulations tightly control the fill and/or excavation of wet-



J. McShane

Approximately 80% of the nation's wetlands are located in floodplains, so protecting and restoring these critical areas is important for storing floodwaters, as well as providing habitats for wildlife.

lands mapped or designated by the community. (See *Case Study - Integrated Watershed Management Program, Baltimore County, Maryland.*)

4.2 The Challenges in Floodplain Management for Policy Makers

While floodplain management programs and practices have improved significantly since the 1960s, there is a continuing loss of natural and beneficial floodplain functions. In large part this is due to a lack of explicit goals, insufficient technical data, inadequate coordination and a failure to use watershed-based approaches to managing our land and water resources. While the nation has a clearer understanding of the benefits of floodplains and has accepted the concept that floodplains should be preserved, many challenges lie ahead before we can turn the idea of preserving floodplains into measurable actions towards improved, restored, or protected floodplain values and functions. These challenges, which necessitate floodplain management actions by local, state, and Federal governments, are discussed below.

Clear Guidance on Considering the Natural and Beneficial Functions of Floodplains

Without a clear and specific mandate to consider natural and beneficial floodplain functions, elected officials and other policymakers and personnel involved in flood loss reduction at all levels of government may not properly assess or consider these functions in their planning and implementation efforts. Comprehensive and concise program guidance is needed on effective methods for floodplain management that protect and restore natural and beneficial floodplain functions that provide for a unified effort by all levels of government.

Communities participating in the National Flood Insurance Program (NFIP) have adopted floodplain regulations to prevent fill and other obstructions in floodway areas, and that require elevation or other protection for new structures to above the "100-year" flood elevation. While some states and communities have established additional regulations that guide local floodplain development, they generally have not established specific policies that protect and restore the natural and beneficial functions of floodplains. However, additional efforts to outline floodplain resources nationally must be combined with the establishment of national standards for protecting the natural and beneficial functions of floodplains. This approach would provide the framework to support a unified, national approach to managing floodplain resources.

Post-Disaster Opportunities

Often the most practicable opportunities for protecting and restoring natural floodplain functions occur after flood disasters as part of the response and recovery operations. Opportunities arise to relocate structures, create greenways, acquire easements or fee title to property, restore stream banks and wetlands, reconstruct roads, bridges, dikes and levees, and to repair or redesign sewer and water systems in ways that benefit floodplain functions. There may also be opportunities to change attitudes toward development in the floodplain. However,

protecting and restoring natural and beneficial functions is not the primary consideration in the aftermath of a crisis. During response and recovery efforts, technical assistance should be provided on long-term floodplain management approaches to both Federal emergency management agencies and to planners at the state and municipal levels. Information should be targeted to beneficial approaches to the management of sensitive areas and the techniques to restore such areas. All response and recovery efforts should include floodplain restoration and protection as a key component of project planning.

Watershed Approaches

Floodplain functions are not confined to larger rivers and streams – the focus of many floodplain management efforts. The floodplains of lakes and estuaries and smaller rivers, streams and creeks play significant roles in flood storage and conveyance, erosion control and habitat functions. The beneficial functions of both smaller and larger streams are dependent upon the overall hydrologic and ecological regimes of the watershed in which they are located. Activities throughout the watershed area, such as urbanization, land management practices, and non-point source pollution, can affect these natural and beneficial floodplain functions. A watershed-based approach incorporates these smaller yet vital waterways and the processes and activities taking place in the watershed.

In recent years, many Federal agencies have begun to use a watershed or ecosystem approach to resource protection when evaluating their actions. They recognize that preserving and restoring the natural and beneficial functions and resources of floodplains requires that they consider the characteristics of the entire watershed, not just the floodplains themselves. For example, efforts to restore eroded stream banks may fail if development has increased the impervious surface in the watershed, altering the hydrology of the watershed and the flow regime of the stream. Watershed and ecosystem approaches also allow agencies to identify and evaluate the critical resources in a watershed and focus limited resources on the primary issues and resources of concern.

Interagency Coordination

Limited coordination between agencies administering emergency management, water resources management, and ecosystem-based programs can hinder their overall effectiveness as well as their ability to protect natural floodplain functions. Improved interagency communications, in addition to specified and shared objectives between various levels of government, are instrumental in creating a unified support system for successfully managing resources. Effective interagency coordination prevents the duplication of actions or creation of conflicts that can occur between agency efforts in both pre-flood and post-flood contexts, and ensures that multi-objective approaches are not overlooked. Strong coordination also results in a more efficient use of government funds and agency personnel, allowing the leveraging of funds from several sources to implement an action that a single agency may not have the resources or authorities to fund individually.

Partnerships

Effective multi-objective and multi-level partnerships are essential to protecting and restoring the natural and beneficial functions of floodplains. Scientific and regulatory standards alone are not enough; there must be a willingness among floodplain stakeholders to work together to develop programs to achieve this goal. Involvement of a wide variety of stakeholders and leveraging of limited Federal funds and resources with those of state and local government and the private sector can result in plans and projects in floodplains that more fully account for natural and beneficial functions while at the same time reducing flood losses.

Non-Structural Solutions

In the past, limited consideration was given to non-structural alternatives in formulating flood loss reduction plans. Evaluation procedures, including those used to determine benefit/cost ratios were focused on structural flood control measures and often do not work as well for non-structural approaches. Today, non-structural solutions are gaining greater attention and through their success, these methods are proving their worth. Comprehensive non-structural ap-

proaches to flood damage reduction also preserve and promote the restoration of the natural resources of floodplains as well as the benefits that they provide.



National Archives, Still Pictures Branch

Non-structural solutions to reducing flood losses, such as relocating buildings out of the floodplain, are gaining greater attention and proving their worth.

Government Subsidies

Some government programs continue to subsidize or encourage public and private development and reconstruction within floodplains regardless of the risk of flooding. These programs are often the unintended consequences of other well-meaning programs and do not consider the natural and beneficial functions of floodplains. This has been particularly true for post-disaster recovery programs. However, the focus today appears to be shifting from flood recovery to flood damage prevention. Government subsidized programs must be limited in the type of development and recovery or reconstruction assistance they provide within floodplain environments so that they do not inadvertently encourage actions that damage the natural and beneficial functions of floodplains or increase flood damages.

Technical Expertise

Agencies involved in flood loss reduction and emergency management at all levels of government must have staff with the scientific expertise necessary to identify and protect the natural and beneficial functions of floodplains. They

must also possess or have access to the technical skills required to interpret and utilize available information on these functions. Government affiliated and sponsored programs should train planners and emergency response employees, and others who lack experience with floodplain issues in the identification and strategic management of floodplain resources. This approach would be particularly advantageous for small municipalities where access to personnel knowledgeable about floodplain resources may be limited. Training efforts should address the issues of planning, mapping, restoration and comprehensive management related to the natural and beneficial functions of floodplains.

Maps and Database Information

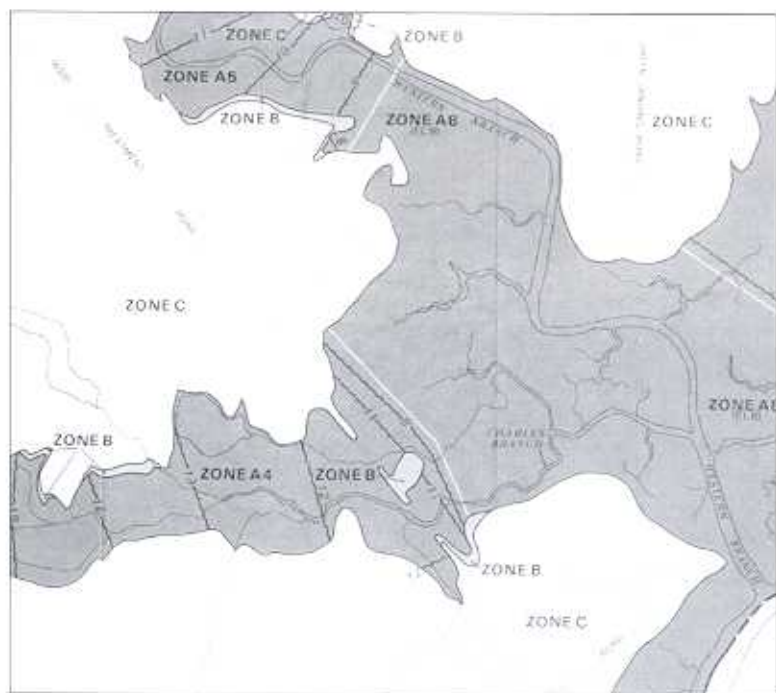
Databases and detailed maps identifying floodplain areas have been created for the majority of the nation. FEMA and other agency flood hazard maps and studies are useful in identifying flood conveyance, flood storage capacity, wave attenuation and erosion areas. However, information on many of the other natural and beneficial functions of floodplains for these same areas is often limited. While flood hazard maps are usually created using the latest technology, they are not currently integrated with databases that have information on the resources and natural and beneficial functions of floodplains.

Often there are discrepancies or incompatibilities among the software used by Federal, State and local agencies. This, combined with limited funding, limits the availability of information. Although there are some publicly and privately funded grant programs that can furnish software, equipment and provide technical training for smaller agencies, knowledge of these programs is limited.

Where maps and databases on natural floodplain functions are available, floodplain managers often do not know about their availability or understand their use. Federal, state and local government budgets provide only limited funding to carry out surveys, inventories, assessments, and planning or implementation efforts for the natural and beneficial functions of floodplains. Government officials at all levels are often unfamiliar with potential funding sources relative to map and database development and the access to the information these resources can provide.



Government programs should train planners and emergency managers in the identification and management of floodplain resources.



Flood Insurance Rate Maps (FIRMs) and other flood data produced by FEMA provide information on flooding, but information on the natural and beneficial functions of floodplains is often limited.

Finally, maps and databases need to synthesize and integrate information on all of the components of floodplain management and resources in a format that will benefit scientists, technicians and educators, as well as government agencies on all levels.

Meeting These Challenges

Section five of this report, **Recommendations**, builds on the Current State of Floodplain Management and Challenges to Policy Makers, and provides a comprehensive listing of actions to meet these challenges and improve efforts for the restoration and preservation of natural and beneficial functions of floodplains for the 21st Century.

Vision Statement

The Task Force concludes that protecting and restoring the natural and beneficial functions of floodplains will not only reduce flood damages, but also contribute to a community's economic and social wellbeing. As we continue to live in close proximity to rivers and streams, naturally functioning floodplains will become increasingly critical community assets. Preservation and restoration of the natural and beneficial functions of floodplains depends on preventative flood management policies, programs and initiatives. While much of this will occur as a result of initiatives at the state and local levels, Federal programs and policies must support and encourage these efforts.

Section Five TASK FORCE RECOMMENDATION

The Task Force recognizes that socio-economic considerations (in particular the need to allow for existing and future development in flood plains) must be balanced with the need for protection of the natural and beneficial functions of floodplains. This is especially true for heavily developed floodplains where economic concerns have taken priority and alternative locations are limited. Nevertheless, opportunities do exist even in densely developed areas to preserve or restore the natural and beneficial functions of floodplains and to reduce flood losses through improved floodplain management. Recommendations must be framed by a multi-objective view of floodplain management using watershed-based approaches.

The Task Force recommendations are described below, including specific items that are needed to implement them. The goal of these recommendations is to protect and restore the natural resources and functions of floodplains and reduce flood losses. The following guiding principles were applied in developing the recommendations:

- Focus on natural, non-structural solutions to reducing flood damages, while maintaining the flexibility to use more traditional structural approaches where appropriate.
- Create a framework for more effective Federal, State, tribal, and local coordination of floodplain management programs that include the protection and restoration of the natural and beneficial functions of floodplains.



Protecting and restoring the natural floodplain environment would help protect property and reduce flood losses such as those caused by Hurricane Georges in this subdivision.

- Create and encourage community partnerships to develop comprehensive solutions that reduce damages and improve quality of life that at the same time protect and restore of the natural and beneficial functions of floodplains.
- Focus on watershed-based solutions that include the protection and restoration of floodplains, and riparian and wetland ecosystems.

RECOMMENDATION 1:

Develop a national policy on the protection and restoration of the natural and beneficial functions of floodplains as an integral part of all Federal, State, tribal, and local government programs, actions, planning, policies, regulations, and grants. Specifically:

- Consider the enactment of legislation for a National Floodplain Management Act that would declare national policy and goals for floodplain management, including the need to protect and enhance the natural resources and functions of floodplains, and address the respective roles and responsibilities of Federal, State, tribal and local governments in achieving floodplain management goals.
- Consider the enactment of legislation that limits future Federal expenditures and financial assistance in undeveloped floodplains. Such legislation should be based on an assessment of existing incentives and disincentives for individuals, business, and communities to use floodplains wisely and would achieve the following: minimize flood losses by discouraging development in high-risk areas, encourage wise expenditures of Federal resources, and protect the natural and beneficial functions of floodplains.
- Update and re-issue *Executive Order 11988, Floodplain Management* to reaffirm Federal policy regarding the protection and enhancement of the natural resources and functions of floodplains, and to reemphasize the need for Federal agencies to avoid activities that adversely impact floodplains. Require all Federal agencies to review their programs, regulations, and policies for compliance with Executive Order 11988.
- Develop a unified national policy that addresses the protection of the natural and beneficial values of coastal floodplains and their associated resources. This policy should focus on nonstructural measures for reducing flood losses resulting from long-term erosion forces and short-term, high impact storm events.

RECOMMENDATION 2:

Encourage a proactive and long-term approach to floodplain management, including the development of pre- and post-disaster plans for flood damage reduction and preservation/restoration of natural and beneficial functions.

- Incorporate the protection and restoration of natural and beneficial functions in pre- and post-disaster planning and management efforts by all levels of government.

RECOMMENDATION 3:

Enhance the capabilities of State, tribal, and local programs and planning processes that protect and restore natural and beneficial floodplain functions.

- Improve public education and outreach regarding the array of Federal programs that support floodplain management activities and provide post-flood recovery opportunities.
- Assist communities to better understand how to incorporate future flood risk reduction and environmental restoration and natural floodplain enhancement efforts in development and zoning decisions.
- Promote effective implementation and compliance of the floodway requirements in those NFIP communities with designated floodways. Where appropriate, concentrate on clearing floodways through acquisition and relocations of homes/buildings. Effective implementation would establish buffer areas between the water and development that would protect the natural resources and functions of floodplains.
- Provide greater incentives to develop stronger State/tribal/regional/local floodplain and watershed management capabilities.
- Assist State/local/tribal/regional organizations to acquire the necessary expertise and tools for effective floodplain management.
- Support groups such as the Western Governors' Association, the National Governor's Association, the Association of State Floodplain Managers, and similar groups in their efforts to promote sound floodplain management at the State and local levels.
- Support local planning processes and projects that protect and restore natural and beneficial floodplain functions.

RECOMMENDATION 4:

Focus restoration and protection efforts on those floodplains or portions of floodplains identified as having the greatest flood risks and significant natural and beneficial functions.

- Through pre-disaster planning and interagency coordination, identify riparian and coastal floodplain areas to be acquired or restored that would contribute to the reduction of future flood risk and damages and lead to the maximization of environmental benefits. Improve the efficiency of post-disaster recovery efforts through clear identification of target areas for potential non-structural flood loss reduction alternatives.

- Maximize the use of all potential funding sources before and after a disaster to protect and restore natural and beneficial functions of floodplains. Utilize these resources to stimulate and assist in the development of State/tribal watershed initiatives and local model floodplain management programs.
- Ensure that mitigation and post-flood recovery measures after disasters do not create adverse impacts on the natural and beneficial functions of floodplains, but rather to the maximum extent possible, protect, restore and enhance those functions.

RECOMMENDATION 5:

Improve the analytical approaches to floodplain management by providing scientific and technical assistance, including economic guidance, to organizations with floodplain management responsibilities.

- Develop quantitative methods to determine the value of floodplain resources and functions. These will include the assessment of floodplain data needs such as mapping and assessment procedures for natural and beneficial floodplain functions, analyzing and modeling hydrologic, hydraulic and geomorphologic properties, and socioeconomic costs and benefits associated with floodplain uses.
- Coordinate a study to determine annual flood loss in the U.S. This study should include "natural" flooding from streams, rivers and coastal storm surges, as well as "man-made" flooding induced by poor stormwater management practices.

RECOMMENDATION 6:

Encourage natural, non-structural solutions to reducing flood damages.

- Review and revise the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* to ensure that the value of the natural resources and functions of floodplains is given equal consideration with economic goals.
- Modify the current benefit-cost analysis methods to include and reflect the long-term environmental and economic benefits derived from utilizing non-structural alternatives to allow for an accurate cost comparison with structural alternatives when determining projects and priorities.

RECOMMENDATION 7:

Improve coordination and partnerships among all levels of government and other parties to facilitate the protection and restoration of floodplains.

- Establish a coordinating committee to improve communication and coordination among Federal agencies and State, tribal and local governments in order to develop and promote policies and actions to

protect and restore the natural resources and functions of floodplains. Potential areas of responsibility for the Coordinating Committee should include:

- Encouraging uniform application of policies and enhancement of interagency coordination at the Federal level.
- Proposing legislative initiatives, where appropriate, to achieve water resource management goals.
- Assuring the efficient and equitable resolution of Federal/interstate water management conflicts.
- Exploring the creation of public/private partnerships and promoting collaborative planning to solve complex water resource issues.
- Improve intergovernmental coordination and planning for floodplain management. This coordination and planning should take place before and after disasters to make effective use of the resources of all available programs to facilitate sound floodplain management and the protection of natural functions to reduce the potential for flood loss. Coordination could be provided through entities established for watersheds or river basins.

RECOMMENDATION 8:

Evaluate various Federal programs that impact floodplains to ensure that Federal agency implementation of floodplain management objectives are complementary and support State and local initiatives. Ensure that Federal programs that respond to floods are not working at cross-purposes.

- Cooperative Federal/State/local roles and goals should be reviewed in the context of Federal programs and initiatives to provide for a more effective and efficient process for pre- and post-flood floodplain management actions and for appropriate use of staff and budget resources. The objective is to ensure that these combined efforts both protect the natural and beneficial functions of the floodplain and reduce flood losses.

The Task Force surveyed many sources of information and data to prepare this report, and conducted a number of meetings and workshops. It met in August 1996; February and May 1997; April, June, and July 1998; May, June, August, and September 1999; and May 2000. The task force invited agencies outside its membership to participate in the investigation.

Section Six **SELECTED BIBLIOGRAPHY**

References

- Adamus, P.R., E.J. Clairain, R.D. Smith and R.E. Young. 1987. *Wetland Evaluation Technique (WET); Vol. II: Methodology*. Operation Draft Technical Report Y-87. U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS.
- Adamus, P.R. and L.T. Stockwell. 1983. *A Method for Wetland Functional Assessment*, Volume 1, Report No. FHWA-IP-82-23. U.S. Department of Transportation, Federal Highway Administration, Offices of Research and Development, Washington, D.C.
- Association of State Floodplain Managers. 2000. *National Flood programs in Review-2000*. Madison, Wisconsin.
- Association of State Floodplain Managers. 1996. *Using Multi-Objective Management to Reduce Flood Losses in Your Watershed*. Madison, WI. Prepared for the U.S. Environmental Protection Agency.
- Association of State Wetland Managers, Inc. 1990. *Wetlands and River Corridor Management*. Proceedings of an international symposium held in Charleston, South Carolina, July 5-9, 1989. Berne, NY.
- Bovee, K.D. and R. Milhous. 1978. *Hydraulic Simulation in Instream Flow Studies: Theory and Techniques*. Cooperative Instream Flow Service Group. Fort Collins, Colorado. Paper No. 5. FWS/OBS-78/33.
- Campbell, Matthew J. & Vissering, Colin S. 2000. *Sustainable Re-Development after Flood Disasters. The case for restoration of open space in floodplains*. Proceedings of the National Association of Environmental Professionals Annual Conference, Washington, D.C.
- Clark, J.R. 1995. *Coastal Zone Management Handbook*. Lewis Publishers, Boca Raton, FL.
- Dahl, T. E. 2000. *Status and Trends of wetlands in the coterminous United States 1986 to 1997*. U.S. Department of Interior, Fish and Wildlife Service, Washington, D.C.
- Executive Office of the President. June 1998. *Federal Programs Offering Non-Structural Flood Recovery and Floodplain Management Alternatives*. Washington, D.C.
- Federal Interagency Floodplain Management Task Force. 1996. *Protecting Floodplain Resources: A Guidebook for Communities*. FEMA, Washington, D.C.
- Federal Interagency Floodplain Management Task Force. 1994 revision. *A Unified National Program for Floodplain Management*. FEMA, Washington, D.C.

- Federal Interagency Floodplain Management Task Force. 1986. *A Unified National Program for Floodplain Management*. Washington, D.C.
- Federal Interagency Floodplain Management Task Force. 1992. *Floodplain Management in the United States: An Assessment Report, Volumes 1 & 2*. FEMA, Washington, D.C.
- Federal Interagency Floodplain Management Task Force. *Further Advice on Executive Order 11988 Floodplain Management*. FEMA, Washington, D.C.
- Interagency Floodplain Management Review Committee. 1994. *Sharing the Challenge: Floodplain Management into the 21st Century* (Report to the Administration, Floodplain Management Task Force, Executive Office of the President). FEMA, Washington, D.C.
- Federal Interagency Stream Restoration Working Group. *Stream Corridor Restoration: Principles, Processes, and Practices*. 1998. Washington, D.C.
- Greeson, P.E., J.R. Clark, and J.E. Clark (eds.). 1979. *Wetland Functions and Values: The State of Our Understanding*. American Water Resources Association. Minneapolis, MN.
- Hammer, D.A. 1992. *Creating Freshwater Wetlands*. Lewis Publishers. Boca Raton, FL.
- American Planning Association. 1997. *Subdivision Design in Flood Hazard Areas*. Planning Advisory Service Report Number 473. American Planning Association and the Federal Emergency Management Agency, Chicago, IL.
- Maurizi, S. and F. Poillon. 1992. *Restoration of Aquatic Ecosystems: Science, Technology, and Public Policy*. National Academy Press. Washington, D.C.
- McShane, John H. 1993. *Managing Floodplains to Reduce Flood Losses and Protect Natural Resources*. Proceedings of the National Association of Environmental Professionals Annual Conference. Washington, D.C.
- National Park Service. 1992. *Economic Impacts of Protecting Rivers, Trails, and Greenway Corridors: A Resource Book*, National Park Service. Washington, D.C.
- National Park Service. 1996. *Floods, Floodplains and Folks*, National Park Service. Washington, D.C.
- National Research Council. 1992. *Restoration of Aquatic Ecosystems*. National Academy Press. Washington, D.C.
- National Wildlife Federation. *Higher Ground: A Report on Voluntary Property Buyouts in the Nations Floodplains*. 1998. Washington, D.C.
- Scott, R.C. (1989). *Physical Geography*. West Publishing Co., St. Paul, MN.
- Silverberg, S.M. and M.S. Dennison. 1993. *Wetlands and Coastal Zone Regulation and Compliance*. Wiley Press. New York, NY.
- Task Force on Federal Flood Control Policy. *A Unified National Program for Managing Flood Losses*, House Document 465. 1966. 89th Congress, 2nd Session, U.S. Government Printing Office, Washington, D.C.
- U.S. Army Corps of Engineers. 1994. *Floodplain Management Assessment of the Upper Mississippi River and Lower Missouri Rivers and Tributaries*.

- U.S. Department of the Interior. 1991. *A Casebook in Managing Rivers for Multiple Uses*. National Park Service, Washington, D.C.
- U.S. Department of the Interior. 1975. *Information/Data Handling Requirements for Selected State Resource Management Programs*. Office of Land Use and Water Planning and U.S. Geological Survey, Resource and Land Investigation Program. Technical Supporting Report C. Washington, D.C.
- U.S. Environmental Protection Agency. 1993. *Natural Wetlands and Urban Stormwater: Potential Impacts and Management*. Office of Wetlands, Oceans and Watersheds, Wetlands Division. Washington, D.C. 843-R-001.
- U.S. Fish and Wildlife Service. 1997. *A system for Mapping Riparian Areas in the Western United States*. National Wetlands Inventory.
- U.S. Water Resources Council. 1978. *Floodplain Management Guidelines for Implementing Executive Order 11988*. Reprint from 43 Federal Register 6030, February 10, 1978.
- Whitaker, D., B. Shelby, W. Jackson, and R. Beschta. 1993. *Instream Flows for Recreation: A Handbook on Concepts and Research Methods*. National.

In recent years, the interest in reducing the impact of human activities on the natural and beneficial functions of floodplains has grown. In the following section, the Task Force describes several major programs and initiatives in place that can be used to protect and restore floodplain natural resources and functions. These programs often involve partnerships between the various levels of government and private interests. This is by no means a complete list of programs, but it does provide an overview of some of the more significant efforts in the area of floodplain management, flood loss reduction and floodplain restoration.

Federal Emergency Management Agency

FEMA's responsibilities include coordinating the Federal response to floods and other disasters, providing disaster assistance to states, communities and individuals, administering the National Flood Insurance Program, and administering programs for the acquisition, relocation, or the floodproofing of buildings and other mitigation actions. FEMA also provides technical assistance and promotes governmental and non-governmental floodplain management activities. In addition to a headquarters office in Washington, D.C., the agency has 10 regional offices.

National Flood Insurance Program

FEMA administers the National Flood Insurance Program (NFIP) established by the National Flood Insurance Act of 1968, as amended. The Flood Disaster Protection Act of 1973 and the National Flood Insurance Reform Act of 1994 made significant changes to the program. The primary purposes of the NFIP are to 1) better indemnify individuals for flood losses through insurance, 2) reduce future flood damages through state and community floodplain management regulations, and 3) reduce Federal expenditures for disaster assistance and flood control.

Participation in the NFIP is voluntary. However, Federal agencies are prohibited from providing financial assistance for acquisition or construction of buildings in the floodplains of communities that do not participate. Flood insurance is required as a condition of receiving Federal assistance in the floodplains of those that do participate. FEMA can only provide flood insurance in a community if the community adopts and enforces floodplain management regulations that meet or exceed minimum criteria established by FEMA. Over 19,000 communities now participate in the NFIP including nearly all communities with significant flood hazards.

An important accomplishment of the NFIP has been mapping the nation's floodplains. Flood hazard maps have been issued for over 20,000 communities at a cost of over \$1.2 billion. These maps provide the basis for state and community floodplain management regulations, for calculating flood insurance premiums, and determining whether or not buildings are required to obtain flood insurance as a condition of obtaining mortgage loans or other Federal or Federally related financial assistance. FEMA flood hazard maps are also used by states and communities for emergency management, for land use and water resources

Appendix A FEDERAL PROGRAMS RELATING TO THE NATURAL AND BENEFICIAL FUNCTIONS OF FLOODPLAINS



J. McShane

planning and by Federal agencies when they apply Executive Order 11988, Floodplain Management to their actions. Although the initial mapping of the nation's floodplains is essentially complete, there is a continual need to modernize existing maps, and to revise and update floodplain maps to reflect changed conditions and to include new areas that will be undergoing development.

Most maps along rivers and streams designate a floodway that includes the channel and adjacent floodplain areas that must be protected in order to maintain the capacity of the floodplain to convey floodwaters. Communities must prohibit development in these floodways unless it can be shown that it would cause no increase in flood elevations. The floodway requirements provide significant protection to the natural and beneficial functions of floodplains. Approximately 9,000 square miles of floodway have been designated along 40,000 linear miles of streams and rivers.

Community floodplain management regulations also require that residential buildings be elevated to or above the elevation of the base flood (the flood that has a 1 percent chance of occurring during any given year, also known as the "100-year" flood). Nonresidential buildings can either be elevated or floodproofed (made watertight) to this elevation. The NFIP also has established a Community Rating System (CRS) that provides discounts on flood insurance premiums in those communities that establish floodplain management programs that go beyond NFIP minimum requirements. Over 900 communities participate in the CRS, which accounts for almost two thirds of the NFIP's 4 million flood insurance policies. Under the CRS communities receive credit for more restrictive regulations, acquisition, relocation or floodproofing of floodprone buildings, preservation of open space, and other measures that reduce flood damages or protect the natural resources and functions of floodplains.

FEMA Grant Programs

FEMA also administers two programs that can fund the acquisition, relocation, elevation, or floodproofing of floodprone buildings or other mitigation actions. The largest of these is the Hazard Mitigation Grant Program established under Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988, as amended. Federal funding under this program is based on 15 percent of the Federal expenditures for assistance to states, communities, and individuals for each disaster. This program is generally administered by state emergency agencies that establish funding priorities and select projects. Generally, project applicants are communities. Since 1993, this program has acquired, relocated or elevated over 26,000 floodprone buildings. FEMA also administers the Flood Mitigation Assistance Program established by the National Flood Insurance Reform Act of 1994. This program provides funding to states and communities for flood hazard mitigation planning and for mitigation projects that protect insured buildings. This program is currently funded at \$20 million per year. Under both programs, any acquired property is deeded to the community and must be maintained as open space.

Under Section 406 of Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988, as amended,¹ FEMA provides assistance to states, communities, and certain non-profit organizations for the repair of damaged buildings

and other public facilities. Additional funding is provided to mitigate future damages to those facilities. Funding can also be used to build replacement facilities outside of the floodplain in lieu of repairing the damaged facility.

Disaster Operations

For declared disasters, FEMA activates the Federal Response Plan with 27 signatory agencies. The Federal Response Plan provides a framework for the coordination of the provision of assistance to states, communities, and individuals by Federal agencies. Disasters are declared by the President at the request of the Governor of the impacted state if the impacts of the disaster exceed the ability of the state and the effected communities to respond. For each declared disaster, a Federal Coordinating Officer is appointed to oversee the provision of Federal assistance. The Governor appoints a State Coordinating Officer as his counterpart. FEMA assistance for the repair of damaged public buildings and other facilities is provided in partnership with the state through the state emergency management agency.

Executive Order 11988

FEMA also promotes and coordinates governmental and non-governmental floodplain management activities and is a consulting agency to other Federal agencies on issues relating to implementation of *Executive Order 11988, Floodplain Management*. FEMA also chairs the Federal Interagency Floodplain Management Task Force that develops and updates the Unified National Program for Floodplain Management that provides a conceptual framework for managing the nation's floodplains.

HAZUS: Estimating Potential Losses

HAZUS is a Geographic Information Systems (GIS) based program that runs on a personal computer. Developed by FEMA through a cooperative agreement with the National Institute of Building Sciences (NIBS), HAZUS presently is used to estimate potential losses from earthquake events. However, the system currently is under further development to estimate flood and wind losses as well. The flood module is scheduled to be completed in 2002. Once a community understands its risks, it is better prepared to respond to future events and mitigate damages.

Map Modernization Program

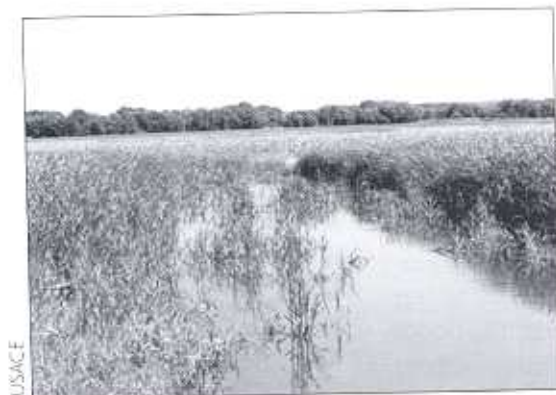
Watersheds and flood hazards change due to development and other factors, and flood maps must be updated to remain accurate. FEMA's modernization plan calls for updating flood data for all communities with no or inadequate floodplain maps and converting all maps into a digital format. The digital maps would support automated applications, such as mortgage determinations, and allow for electronic distribution via the World Wide Web or CD-ROM.

Under the map modernization initiative, state, regional, and local governments become directly involved in the flood mapping process. Under the Cooperating

Technical Community Option, these government entities may be provided funding to complete some or all of the necessary activities for completing and/or modernizing their flood maps. FEMA will furnish guidelines and specifications for doing the work, provide technical assistance, and conduct periodic reviews throughout the process.

U.S. Army Corps of Engineers

Flood Damage Reduction and Ecosystem Restoration Programs



U.S. Army Corps of Engineers
Rice Lake Environmental
Management project – a
170-acre shallow floodplain
lake located on the right
bank of the Minnesota River
within the Minnesota Valley
National Wildlife Refuge near
Minneapolis, Minnesota.

Projects under these two programs include structural (dams, channel improvements, and levees) and non-structural (flood proofing, flood warning/preparedness, permanent evacuation, and the preservation or protection of open space) measures. They must be worthwhile projects, i.e., the benefits derived must be greater than the costs, and they must be cost-shared by local sponsors (state and/or community). As part of the cost sharing, local sponsors must provide lands, easements, rights-of-way, relocation and disposals sites, and maintain the project after completion. Large projects require congressional approval for funding while smaller projects are implemented under continuing authorities.

Technical Assistance

The Floodplain Management Services (FPMS) Program² and the Planning Assistance to States (PAS) Program³ help communities develop and initiate their own plans and actions. USACE specifically developed FPMS to help others mitigate flood damages. The program provides the full range of technical services and planning guidance necessary to support flood damage reduction. Assistance varies from developing site specific data (i.e., depth of flooding at a residence) to helping a community select the most effective measures for a comprehensive floodplain management plan. The PAS, on the other hand, assists in the preparation of comprehensive plans for the development, utilization, and conservation of water and related land resources. Although PAS program authority is much broader, its flood damage reduction assistance is similar to that provided by the FPMS Program.

Challenge 21

Challenge 21 is a flood hazard mitigation and ecosystem restoration program focused on America's floodplain communities. Challenge 21 is a comprehensive program for sustainable approaches to flood hazard mitigation with the goal of protecting natural and beneficial functions of floodplains and reducing flood losses. Through USACE's leadership, Challenge 21 is:

- Focused on non-structural solutions to reducing flood damages, while maintaining the flexibility to use more traditional structures (e.g., levees, flood walls) where appropriate

- Creating a framework for more effective Federal coordination of flood programs
- Creating a community partnership to develop a comprehensive solution to reducing damages and improving quality of life
- Focused on watershed-based solutions that can include the restoration of riparian and wetland ecosystems

Challenge 21 will create restoration partnerships that include FEMA, USDA, Department of Interior, and EPA. By focusing on non-structural alternatives to flood protection, the Challenge 21 program will move families and businesses out of harm's way. Challenge 21 also works to return the floodplains of rivers and streams to a condition in which they are able to naturally moderate floods and provide other functions of benefit to communities and the environment. A project might include the relocation of threatened homes and businesses, conservation or restoration of wetlands and natural floodwater storage areas, and planning for responses and solutions to potential future floods. Watershed by watershed, the Challenge 21 initiative would build on existing programs, and initiate and expand partnerships with other federal agencies and non-Federal national and local entities. Key Federal partners include FEMA, USDA, Department of Interior, and EPA.

Other USACE programs that can protect and restore the natural and beneficial functions of floodplains include the Section 1135 program, which authorizes the Corps to modify water resources projects for the improvement of the environment. (Section 1135 projects typically address water quality issues associated with the activities of the USACE.) The Section 204 program authorizes the Corps to protect, restore and create aquatic and ecologically related habitats such as wetlands that may have been affected by the dredging of Federal navigation projects. However, Section 206 commissions the Corps to carry out aquatic ecosystem restoration programs that will improve the overall quality of the environment, are deemed to be cost-effective and to be in the best interest of the public.

U.S. Department of Commerce

National Oceanic and Atmospheric Administration (NOAA)

National Ocean Service

The National Ocean Service (NOS) is working with state coastal resource and emergency managers, and with Federal agencies in applying unique NOS capabilities and assets to assist in disaster recovery and mitigation activities. Among these unique capabilities, NOS is prepared, if tasked by FEMA, to collect data on the extent of flooding for use in floodplain management activities. The Office of Response and Restoration (OR&R) works directly with coastal state and local communities to establish plans for identifying and addressing risks from hazardous material spills associated with natural disasters, including flooding.

Office of Ocean and Coastal Resource Management

The Office of Ocean and Coastal Resource Management (OCRM) continues to work on improving coordination and communication among the many Federal and State agencies that manage coastal hazards.

In partnership with FEMA, OCRM has brought together State Coastal Zone Management (CZM) and FEMA Mitigation Programs for coastal hazard mitigation workshops. These workshops provide a strong start to designing and implementing joint mitigation actions that address floodplain loss reduction goals and can lead to more unified, integrated strategies for risk reduction and coastal hazard management.

Through the coastal management program, OCRM encourages and provides financial support to state efforts to reduce life and property at risk from flooding and storm damage through enforcement of coastal setbacks and preservation of the natural function of coastal systems.



Mississippi's Grand Bay
National Estuarine
Research Reserve.

National Estuarine Research Reserves

The National Estuarine Research Reserve System (NERRS) is a network of protected areas established to improve the health of the nation's estuaries and coastal habitats by developing and providing information that promotes informed resource management. Coastal states and NOAA jointly establish and manage National Estuarine Research Reserves, which are discrete areas containing key habitat within an estuaries are bio-geographically representative of their particular region of the nation. Reserves conduct integrated programs to develop a fundamental understanding of estuaries and the impact of human activities on these areas. They also provide up-to-date, comprehensible information to users and managers of coastal resources and generate innovative solutions to resource management problems.

The NERRS apply science and education to improve the management of estuaries. This network of Federal, State and community partnerships protects approximately one million acres of estuarine waters, wetlands, and uplands. As of spring 1999, twenty-three reserves had been designated and four additional sites were being considered for designation.

Essential Fish Habitat Program

National Marine Fisheries Service (NMFS) and Regional Fishery Management Councils currently are amending Fishery Management Plans (FMPs) to identify and designate essential fish habitats (EFH) for all life-history stages of species covered by FMPs. The amendments will recommend that an ecosystem approach to fisheries management be implemented in response to the designation of an EFH. They will also identify activities with the potential to adversely affect EFH

quantity and/or quality and will include conservation or enhancement recommendations to minimize the adverse effects these activities cause.

Natural Disaster Reduction Initiative (NDRI)

NOAA's contributions to the Department of Commerce's NDRI effort include the following:

Moving Out of Harm's Way

Improved warnings and forecasts for protecting people and property from the immediate threat of natural hazards. NOAA proposes to focus its efforts on supporting and upgrading operational systems and improving predictions critical to forecasting as well as communicating information prior to and during hazardous events. Lead times and accuracy of warnings and forecasts will be improved, thereby enabling emergency managers, businesses, and communities to better prepare and respond to extreme events.

Keeping Out of Harm's Way

New information for private and public sectors of society to ensure that people and property are either not in the path of natural hazards in the first place or are more resilient to them when they occur. NOAA will work with Federal, state, and industry partners to identify areas of high hazard risk and develop techniques for mitigating hazard impacts. The partners will work to improve local and state capabilities to prevent disasters from occurring. These measures are expected to improve hydrologic forecasts at several time scales. They will assist water resource managers and emergency managers in reducing the impact of floods and will provide risk assessments of the exposure or vulnerability of communities to natural hazards that can be used in land use planning and building at local and state levels.

The NDRI will allow NOAA to improve forecasts of weather-related natural disasters ranging from a few minutes to several months in advance. NOAA also will be able to provide local, state, Federal, and private-sector partners with better information on how to avoid and mitigate the impacts of natural hazards.

National Weather Service (NWS) Hydrologic Services Program

This program provides river and flood forecasts, warnings for protection of life and property, and basic hydrologic forecast information for the nation's economic and environmental well being. In addition, the NWS provides detailed estimates of flood losses from 1903 to present. These estimates are compiled from information provided by NWS field offices and other Federal agencies and include direct damage due to flooding that results from rainfall, snowmelt, and dam failures.

NWS Advanced Hydrologic Prediction Services (AHPS)

AHPS consists of a combination of software and hardware tools used for analyzing data and creating graphic displays of probability forecasts of river flows and levels. AHPS builds upon NOAA's modern technologies, i.e., Doppler weather

radar, geosynchronous satellites, supercomputers, automated weather observation stations, and the new interactive weather computer and communications system workstations known as AWIPS. Within AHPS the NWS weather and climate forecasts are coupled with hydrologic numerical models to provide a suite of hydrologic forecast products from days to months in advance. These probabilistic forecasts will better convey to the public the uncertainties associated with weather and flood forecasts, and help people understand their risk and take appropriate action to prepare for and avoid potential flood losses.

U.S. Department of Agriculture

Natural Resources Conservation Services (NRCS)

NRCS works in partnership with 3,000 local conservation districts by which it provides technical assistance to the Nation's private landowners. This partnership is supported by personnel and funds provided by the Conservation Technical Assistance (CTA) program, the base program for NRCS. Through memorandums of understanding between the Secretary of Agriculture and the local conservation districts and with CTA funded by annual appropriations, NRCS implements conservation programs by providing cost-sharing and technical assistance on private land. The conservation districts, which often match county boundaries, are organized under State and Tribal laws and are directed by locally elected directors or supervisors.

Watershed Surveys and Planning

Section 6 of Public Law 83-566 provides for cooperation with Federal, State, and local agencies in making investigations and surveys of watersheds as a basis for the development of coordinated programs. Reports of the investigations and surveys serve as guides for the development of water, land, and related resources in agricultural, rural, and urban areas within upstream watershed settings. They also serve as a basis for coordination with major river systems and other phases of water resource management and development.

Section 3 of Public Law 83-566 provides for assisting sponsoring local organizations to develop a plan on watersheds. During planning, problems such as water quality, flooding, water and land management, and sedimentation are evaluated and works of improvement are proposed to alleviate problems. Works of improvement may include both structural and non-structural practices as well as the purchase of conservation easements. The resulting watershed plans estimate benefits, costs, cost-sharing rates, and arrange for operation and maintenance necessary to justify Federal assistance to implement the works of improvement.

Watershed Operations, PL 83-566

Technical and financial assistance is provided in cooperation with local sponsoring organizations, state, and other public agencies to voluntarily develop and implement plans on private lands for watersheds not exceeding 250,000 acres.

The program provides a vehicle for local people to build partnerships and requires local and state funding contributions. The purposes of watershed projects include watershed protection, flood prevention, water quality improvements, soil erosion reduction, rural, municipal and industrial water supply, irrigation water management, sedimentation control, fish and wildlife habitat enhancement and create and restore wetlands and wetland functions.

Watershed plans involving an estimated Federal contribution in excess of \$5,000,000 for construction, or construction of any single structure having a capacity in excess of 2,500 acre-feet, require congressional committee approval. Other plans are approved administratively. After approval, technical and financial assistance can be provided for installation of works of improvement specified in the plans.

Project sponsors are provided assistance in installing planned land treatment measures. Surveys and investigations are made and detailed designs, specifications, and engineering cost estimates are prepared for the creation of structural measures. Areas where sponsors need to obtain land rights, easements, and rights-of-way are delineated. Technical and financial assistance are available to landowners and operators in planning and application of needed conservation measures on their individual units. There are presently over 1651 projects that have been approved.

Emergency Watershed Protection Program

The Emergency Watershed Protection Program (EWP) was set up by Congress to respond to emergencies created by natural disasters. It is designed to relieve imminent hazards to life and property caused by floods, fires, windstorms, and other natural occurrences. The purpose of EWP is to help groups of people with a common problem. All projects undertaken, with the exception of floodplain easements, must be sponsored by a political subdivision of the State, such as a city, county, general improvement district, or conservation district. Public and private landowners are eligible for assistance but must be represented by the project sponsor.

NRCS may bear up to 75 percent of the construction cost of emergency measures. The remaining 25 percent must come from local sources and can be in the form of cash or in-kind services. All EWP work must reduce threats to life and property and be economically and environmentally defensible.

Sponsors are responsible for providing land rights and securing the necessary permits. EWP work is not limited to any one set of prescribed measures. A case-by-case investigation of the needed work is made by NRCS and can include: removing debris from stream channels, road culverts, and bridges; reshaping and protecting eroded banks; correcting damaged drainage facilities; repairing levees and structures; reseeding damaged areas; and purchasing floodplain easements.

In 1996, the Congress authorized NRCS to purchase floodplain easements on flood damaged land. Through floodplain easements, NRCS attempts to restore the functions and values of the floodplain.

EWP funds cannot be used to solve problems that existed before the disaster, to improve the level of protection above that which existed prior to the disaster, or to install measures not essential to the reduction of hazards. EWP cannot fund operation and maintenance work, or repair private or public transportation facilities or utilities and cannot adversely affect downstream water rights. In addition, EWP funds cannot be used to perform work on measures installed by another Federal agency. City and county governments, general improvement districts, and conservation districts are the most common sponsors of EWP projects.

Flood Prevention Work, PL 78-534

The Flood Control Act of 1944 authorized the Secretary of Agriculture to install watershed improvement measures to reduce flood, sedimentation, and erosion damages; further the conservation, development, utilization, and disposal of water; and the conservation and proper utilization of land. Flood prevention work is authorized in the eleven watersheds designated in the Flood Control Act of December 22, 1944.

Because the authorized flood prevention projects include relatively large areas, work plans are developed on a sub-watershed basis. As of September 30, 2000, the total planning job was about 74 percent completed, with 319 work plans completed that include 24,268,159 acres.

Wetlands Reserve Program



USDA NRCS

The NRCS is working together with local landowners on the largest wetland project ever undertaken in the state of Wisconsin. Over 1,700 acres of open water and grassy wetland are being restored to their former beauty and wetland value.

The Wetlands Reserve Program (WRP) is a voluntary program to restore or protect wetlands on private property by establishing conservation easements of either permanent or 30-year duration, or by restoration cost-share agreements where no easement is involved. The landowner receives payment based on the agricultural value of the land and up to 100 percent of the restoration costs for restoring the wetlands.

The WRP is an opportunity for landowners to receive financial incentives to restore and protect wetlands in exchange for retiring marginal agricultural land. Congress

authorized WRP under the Food Security Act of 1985, as amended by the 1990 and 1996 Farm Bills. The U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) administers the program in consultation with the Farm Service Agency (FSA) and other Federal agencies. Funding for WRP comes from the Commodity Credit Corporation. States operated the program using a continuous sign-up as process.

Landowners who choose to participate in WRP may sell a conservation easement or enter into a cost-share restoration agreement with USDA to restore and

protect wetlands. The landowner voluntarily limits future use of the land, yet retains private ownership. The landowner and NRCS develop a plan for the restoration and maintenance of the wetland. The program offers landowners three options: permanent easements, 30-year easements, and restoration cost-share agreements of a minimum 10-year duration.

Other agencies and private conservation organizations may provide additional assistance for easement payment and wetland restoration costs as a way to reduce the landowner's share of the costs. Such special partnership efforts are encouraged.

Eligible land includes: wetlands farmed under natural conditions; farmed wetlands; prior converted cropland; farmed wetland pasture; farmland that has become a wetland as a result of flooding; rangeland, pasture, or production forestland where the hydrology has been significantly degraded and can be restored; riparian areas which link protected wetlands; lands adjacent to protected wetlands that contribute significantly to wetland functions and values; and previously restored wetlands that need long-term protection.

U.S. Environmental Protection Agency

Watershed Approach

The watershed approach is a coordinating framework for environmental management that focuses public and private sector efforts on addressing the highest priority problems within hydrologically defined geographic areas. Both ground and surface water flow are taken into consideration.

The EPA supports watershed approaches with the goal of preventing pollution and achieving and sustaining environmental improvements that also meet other important community goals. Although watershed approaches vary in terms of specific objectives, priorities, elements, timing, and resources, they are all based on the following guiding principles:

- **Geographic Focus:** activities are directed within specific geographic areas, typically the areas that drain to surface water bodies or recharge or overlay ground waters, or a combination of both
- **Sound Management Techniques based on Strong Science and Data:** collectively, watershed stakeholders employ sound scientific data, tools, and techniques in an iterative decision-making process
- **Partnerships:** those people most affected by management decisions are involved throughout and shape key decisions

Since stakeholders work together, actions are based upon shared information and a common understanding of the roles, priorities, and responsibilities of all parties involved. Concerns about environmental justice are addressed and, when possible, pollution prevention techniques are adopted. The iterative nature of the watershed approach encourages partners to set specific goals and make maximum progress while continuing analysis and verification in areas where information is incomplete.



J. Usher

The "Great Swamp" in southeastern New York provides thousands of acres for storing the floodwaters of the East Branch of the Croton River (as shown above during a flood event). It also provides habitats for a wide variety of flora and fauna, excellent water quality for a downstream reservoir, and is a canoeist's paradise.



J. McShane

Operating and coordinating programs on a watershed basis makes sense environmentally, financially, socially, and administratively. For example, by jointly reviewing assessment effort results for drinking water protection, pollution control, fish and wildlife habitat protection and other aquatic resource protection programs, managers from all levels of government can better understand the cumulative impacts of various human activities. Critical problems within each watershed also can be determined. Using this information to set priorities allows public and private managers to allocate limited financial and human resources to address the most critical needs. Establishing environmental indicators helps guide activities toward solving high priority problems and measuring success in making real world improvements rather than simply fulfilling programmatic requirements.

The watershed approach strengthens teamwork between the public and private sectors at the Federal, state, tribal, and local levels to achieve the greatest environmental improvements with the resources available. This emphasis gives those people who depend on the aquatic resources for their health, livelihood, or quality of life a meaningful role in resources management. Through such active and broad involvement, the watershed approach can build a sense of community, reduce conflicts, strengthen commitment to the actions necessary to meet societal goals and ultimately improve the likelihood of sustaining long-term environmental improvements.

Section 319 of the Clean Water Act

Section 319 of the Clean Water Act established a national program to control nonpoint sources of water pollution, and was implemented by States with Federal approval and assistance. States address nonpoint source pollution by:

- Developing nonpoint source assessment reports;
- Adopting nonpoint source management programs; and
- Implementing the management programs over a period of years.
- All States, Territories, and 52 Tribes now have EPA-approved nonpoint source assessment reports and management programs. Section 319 also authorizes EPA to issue annual grants to States, Territories, and Tribes to assist them in implementing their programs, requiring at least a 40 percent non-Federal dollar match. In FY 1999 and 2000,

Congress appropriated \$200 million each year for these grants. Funds are used for NPS program implementation, including technical assistance, financial assistance, education, training, technology transfer, demonstration projects, and monitoring.

Section 320 of the Clean Water Act: The National Estuary Program

The National Estuary Program (NEP), established pursuant to Section 320 of the 1972 Clean Water Act, is a watershed-based approach to protecting nationally significant estuaries. In the 28 estuaries that currently comprise the NEP, the program engages local communities and stakeholders to identify and characterize problems within coastal watersheds and to devise and implement comprehensive conservation management plans that address these problems. The overarching goal is to protect and restore the estuary's water quality and the integrity of the entire system – its chemical, physical, and biological properties, as well as its economic, recreational, and aesthetic values. The Coastal Management Branch of EPA's Oceans and Coastal Protection Division administers the NEP and provides guidance and support to state, tribal, and local entities to protect their coastal watersheds.

Section 404 of the Clean Water Act

Section 404 of the Clean Water Act established a program to regulate the discharge of dredge and/or fill material into the waters of the U.S., including wetlands. Regulated activities include fill for development, water resource projects, infrastructure and conversion of wetlands to agricultural use. The program's basic premise is that the discharge of dredged or fill material is not permitted if the nation's waters would be significantly degraded or if a practicable alternative exists that is less damaging to the aquatic environment. USACE and the EPA jointly administer the program, although the USACE actually grants or denies the permit.

U.S. Department of Interior

National Park Service (NPS)

The Rivers, Trails, and Conservation Program (Rivers & Trails): Facilitating Community-Based Conservation Action

The RTCA Program was established to help citizens improve their quality of life through the conservation of rivers and the establishment of trails on lands outside national parks and forests. This Federal program allows the NPS to cooperate with state and local efforts. It aids citizen-led efforts to protect significant natural resources and enhance recreational opportunities. The NPS becomes involved at the community's request and serves as a catalyst for local action.

The NPS helps communities set goals, resolve difficult issues, and reach consensus on future use and the protection of important land and water resources. The

RTCA program helps communities protect rivers, trails, and greenways on lands outside the Federal domain and without Federal ownership.

The Rivers & Trails program is based on the principle of partnerships. By working together, residents, landowners, government agencies and private organizations can meet the challenges of conservation. Regional and state organizations coordinate and support local groups and act as umbrella organizations to make their efforts more visible and effective. The NPS works with groups to establish goals, resolve difficult issues and reach agreements on how community resources should be utilized and managed.

Rivers & Trails program staff provides the following types of assistance:

- River, Trail, and Greenway Planning
- Regional Assessments
- Conservation Workshops and Consultations

Information and advice on conservation and recreation topics are available from any NPS office. However, a group must formally apply to receive longer-term assistance.

Successful applicants generally meet several criteria:

- An Involved Public: conservation projects are more likely to succeed if they have broad public support
- Cost-Sharing and Cooperation: public agencies and private groups sponsoring a project must help fund it, with either cash or in-kind services
- Results Orientation: successful applications have specific, tangible, attainable goals
- Significant Resources: proposed projects should protect or enhance important community resources (such as rivers, trails, and landscapes) that will improve the quality of life for residents and visitors alike

U.S. Fish and Wildlife Service (USFWS)

The mission of the Fish and Wildlife Service (USFWS), working with others, is to conserve, protect and enhance fish, wildlife and their habitats for the continuing benefit of the American people. Floodplain habitats such as wetlands and riparian areas are very productive, supporting a wide variety and diversity of fish and wildlife resources. Activities under most USFWS programs include the protection and restoration of fish and wildlife resources and habitats in floodplains. Service activities may also benefit other floodplain functions such as improving water quality, increasing groundwater recharge, stabilization of stream banks, etc.

USFWS programs may also contribute to flood loss reduction. Protection and restoration of wetlands and other floodplain habitats through actions on Service lands, programs with private landowners and others, and acquisition of floodplain areas after flood events, may increase the storage area for flood waters

and slow flood flows. These activities also reduce flood losses by eliminating activities and structures from flood-prone areas and by maintaining these areas free from incompatible development. Flood loss reduction is also the purpose of other agency projects on which the Service provides planning assistance. The following is a brief summary of USFWS programs, all of which are involved to some degree in the protection and restoration of fish and wildlife resources and habitats and other floodplain functions.

Project Planning

The USFWS is involved in several programs that include protection and restoration of fish and wildlife habitats in floodplains. The Service works with permit and license applicants, developers and Federal agencies to evaluate impacts of proposed water resource development projects on fish and wildlife resources. The USFWS makes recommendations to conserve and protect fish and wildlife while facilitating the balanced development of the nation's resources. The Service provides advice and recommendations on fish and wildlife impacts to other agencies in the planning of flood control projects. In recent years, increasing emphasis has been placed on flood loss reduction through non-structural means such as easements and floodplain evacuation.

Primary authorities for the Service's involvement include the Fish and Wildlife Coordination Act, the Endangered Species Act and the National Environmental Policy Act (NEPA). The Coordination Act requires coordination with the Service whenever a Federal agency constructs, permits or licenses a water resource development project. Where listed or proposed endangered and threatened species or their critical habitats are involved, consultation takes place under Section 7 of the Endangered Species Act. The Service also provides comments on and may be a cooperating agency for the preparation of evaluations and documents under NEPA.

Coastal Program

The Fish & Wildlife Service is working to conserve coastal resources. The Coastal program identifies important coastal resource problems and solutions, seeks partnerships to carry out on-the-ground conservation projects, and encourages public action in 11 high priority coastal areas. In the past seven years, this program has restored over 54,160 acres of coastal wetlands, 19,670 acres of coastal upland, and 645 miles of riparian habitat; protected an additional 227,990 acres of habitat through conservation easements; and reopened 3,300 miles of coastal streams to anadromous fish passage. Coastal Wetlands Conservation Grants are awarded each year to coastal States for the acquisition, restoration, or enhancement of coastal wetlands and tidelands. Since it began in 1992, 25 States and one U.S. Territory have been awarded \$75 million to protect and/or restore 93,000 acres of coastal wetlands and submerged habitat. The Coastal Barrier Resources System is a defined set of undeveloped high risk coastal barriers. The intent the legislation that established these areas was to reduce Federal support (including Federal flood insurance) for development in these high risk areas. As a result, Federal funds are saved, lives are protected, and important natural resources are conserved.

Partners for Fish and Wildlife



USFWS / W. Vinge

Naturally functioning wetlands are vital to ensuring good nesting and brood habitat for the canvasback duck. Habitat conservation programs that involve farmers and other large landowners are key to the continued success of the canvasback and many other waterfowl species.

The USFWS Partners for Fish and Wildlife Program works in voluntary partnership with private landowners and other partners to restore floodplains, wetlands and other important fish and wildlife habitats. Program purposes are to improve the quantity and quality of wetlands, grasslands, riparian and in-stream habitat, and other important habitats; and to directly involve private landowners in pro-active stewardship of Federal trust species habitats. Landowners agree to maintain restoration projects as specified in cooperative agreements, but otherwise retain full control of the land. To date this program has resulted in the restoration of over 526,000 acres of wetlands, 550,000 acres of prairies/grasslands, and 3,200 miles of riparian/in-stream habitat through 24,000 landowner agreements. The program also develops Fisheries Habitat Restoration Partnerships to facilitate habitat restoration projects for imperiled freshwater fishery resources in the United States.

The USFWS assists the Department of Agriculture agencies and private landowners under the conservation provisions of the Farm Bill (e.g., Wetlands Reserve Program, Conservation Reserve Program, Wildlife Incentive Program, and Wetland Conservation provision). The USFWS provides technical assistance on site selection, restoration planning and compatible uses; wetland identification; and assessment of functions and values.

National Wetlands Inventory

The National Wetlands Inventory (NWI) produces information on the characteristics, extent, and status of the Nation's wetlands and deep-water habitats. Federal, State, and local agencies, academic institutions, Congress, and the private sector use this information. The NWI has mapped 90 per cent of the lower 48 states, and 34 per cent of Alaska, of which about 44 per cent and 13 per cent, respectively, have been digitized and are available on the Internet World Wide Web (<http://wetlands.fws.gov>). The NWI also produces status and trends reports on wetland losses and gains for Congress at ten-year intervals.

The public makes extensive use of NWI maps in a myriad of applications including planning for watershed and drinking water supply protection, siting of transportation corridors, construction of solid waste facilities, and siting of schools and other municipal buildings. Resource managers in the Service and the States use maps for effective habitat management and acquisition of important wetland areas needed to perpetuate migratory bird populations, for fisheries restoration, floodplain planning, and endangered species recovery plans. Agencies from the Department of Agriculture use the maps as a major tool in the identification of wetlands for the administration of their programs. Regulatory agencies and private sector planners use the maps to help in advanced wetland identification procedures, and to determine wetland values and mitigation requirements in framing alternative plans to meet regulatory requirements.

Environmental Quality Program

The Environmental Quality program directs efforts to identify and assess contaminant and invasive species effects on fish and wildlife in order to prevent, reduce, and/or eliminate contamination and invasive species problems. The program also documents the interrelationships between contaminants and fish and wildlife impacts. It focuses on activities that prevent contamination and invasive species problems coupled with investigation, mitigation and restoration activities in partnership with Federal, State, non-governmental organizations and the private sector. Environmental Quality Program activities are integrated into all USFWS activities.

USFWS addresses attenuation of the impacts of non-point and point source pollution. Activities aimed at avoiding the adverse effects of contaminants and invasive species to trust resources include consultation with Federal agencies on Federal construction projects, Clean Water Act permit reviews, pesticide use permits and integrated pest management, Endangered Species Act, Section 7 consultations, technical consultations, early planning and review activities, and management recommendations. The Service also determines the effects of oil spills and hazardous substance releases on fish and wildlife resources and ensures protection and restoration of those natural resources.

Endangered Species

Protecting endangered and threatened species and restoring them to a secure status in the wild are the major primary objectives of the Endangered Species Program. The Endangered Species Act provides a comprehensive program where both the public and private sectors can work together to conserve endangered plants and animals and restore them to a secure status in the wild. As of 1999, more than 1,200 species of plants and animals were on the U.S. List of Endangered and Threatened Species.

The USFWS is responsible for listing, reclassifying, and delisting species, overseeing recovery activities for listed species, providing for the protection of important habitat and providing grants to states to assist with their endangered species conservation efforts. The USFWS, or National Marine Fisheries Service, as appropriate, consults with Federal agencies and issues biological opinions on their activities when the activity permitted, funded or conducted by that agency may affect listed species or designated critical habitat, or is likely to jeopardize proposed species or adversely modify proposed critical habitat.

North American Waterfowl Management Plan/ Wetlands Conservation Act

The Fish and Wildlife Service's Division of Bird Habitat Conservation is responsible for implementing the North American Waterfowl Management Plan and the North American Wetlands Conservation Act on an international basis. The intent of the Act is to encourage partnerships to protect, enhance, restore and manage wetland ecosystems and other habitats for migratory birds and other fish and wildlife; maintain current and improved distributions of migratory bird populations; and sustain an abundance of waterfowl and other migratory birds consistent with the goals of the Plan and international obligations with other

countries. Protection strategies include habitat acquisition, conservation easements, leases, and management agreements with private landowners.

Transforming the goals of the Plan into on-the-ground actions relies on a cooperative approach to conservation. The work is accomplished through partnerships called joint ventures comprised of individuals, corporations, conservation organizations, and local, state, provincial, and Federal agencies. There are currently 12 habitat joint ventures in the United States and 3 in Canada. One of the habitat joint ventures has international status (Canada/United States). Partners from Canada and the United States also support three species joint ventures, including a new venture for sea ducks. In Mexico, several regional partnerships have been organized whose goal is to conserve priority wetland areas identified by the Plan. During the next 5 years, several additional joint ventures are expected to be organized in the United States and Mexico. As of 2000, over 5 million acres have been protected, restored or enhanced in the United States and Canada.

National Wildlife Refuge System

The National Wildlife Refuge System (NWRS) is the only diverse national network of public lands and waters set aside for the conservation and management of fish, wildlife and plant resources. The 93 million-acre System contains at least 31 million acres of wetlands, and provides important habitat for many species of birds, mammals, reptiles and amphibians; including threatened and endangered species. In floodplain areas, refuges may benefit other functions in addition to protecting and improving habitat for fish and wildlife. Some floodplain areas are acquired by the USFWS in the establishment of National Wildlife Refuges, thereby protecting the natural resources and functions of these areas and preventing flood losses by maintaining such areas in their natural state.

In flood-prone areas, Federal acquisition and easement programs share capabilities to restore habitats for native species of fish and wildlife and address the needs of landowners subject to flood losses. The Service's National Wildlife Refuge System can act to preserve floodplains where they possess resources that fall under the Federal trust responsibilities and meet the environmental criteria for refuge lands. For example, the 1993 floods in the Midwest along the Iowa, Mississippi and Missouri Rivers resulted in the acquisition of substantial areas of affected floodplains. Altogether, 11 tracts along these rivers totaling 22,452 acres were acquired. Most of these areas were ultimately incorporated as additions to existing refuge complexes.



USFWS/J & K Hollingsworth

Control of water levels is vital to ensure prime vegetation growth for wildlife. National Wildlife Refuge employees periodically check control structures and make adjustments as required, as seen here at Bayou Sauvage National Wildlife Refuge in Louisiana.

Fish and Wildlife Management Assistance

In partnership with other Federal, State, tribal governments, and a variety of private interests, the Service is addressing factors causing declines in native fish populations; and helping restore, enhance, and protect nationally significant fishery resources and aquatic ecosystems. The Service provides management expertise on issues affecting the Great Lakes and inland (non-anadromous) fisheries and related wildlife management issues. In association with other Service Programs, Fish and Wildlife Management Assistance is responsible for a fish passage program that opens up miles of riverine habitats to interjurisdictional and imperiled fish; and, accomplishes water quality and habitat improvement for the benefit of living aquatic resources.

Fisheries habitat restoration efforts are directed to lakes, streams, estuaries, and associated riparian and upland buffer habitats. Projects have concentrated on small watersheds where restoration efforts can focus on producing measurable project-positive outcomes. In-stream and riparian work include:

- The restoration of aquatic and riparian habitats through the construction of artificial habitats
- The planting of indigenous vegetation
- Erosion and pollution discharge control
- The control and/or elimination of invasive plant and animal species
- Evaluation of fish health (wild stock survey)
- Species evaluation in waters where fishery resources have been enhanced by stocking of cultured species

Federal Aid in Fish and Wildlife Restoration

The Federal Aid in Wildlife Restoration Act (better known as the Pittman-Robertson Act) provides funding for the selection, restoration, rehabilitation and improvement of wildlife habitat, wildlife management research, and the distribution of information. Federal funding pays for up to 75 percent of project costs, with the States contributing at least 25 percent. More than 62 percent of the funds are used to buy, develop, maintain and operate wildlife management areas. Some 4 million acres have been purchased outright since the program began and nearly 40 million acres are managed for wildlife under agreements with other landowners. Various kinds of lands have been acquired including winter rangelands for big game, and wetlands, an essential habitat to waterfowl.

The Federal Aid to Sport Fish Restoration Act, commonly referred to as the Dingell-Johnson Act, was modeled after the Pittman-Robertson Act to create a parallel program for management of fishery resources, conservation and restoration. Under the Wallop-Breaux Amendment, the Act was supplemented in 1984 by revenues on additional items of previously untaxed sporting equipment. Funds are used for such things as reclaiming fishing and boating access sites; purchase of fishing access areas, boat landings, piers and fish production

sites; and funding research and inventory projects. Funds are also used to improve aquatic habitats for certain fish species, land acquisition, construction of fishing areas for the public and long-range fisheries research. States receive reimbursement from these funds for 75 percent of the costs of project.



Napa Valley, California

PROJECT NAME: Napa River Flood Protection Project

LOCATION: Napa Valley, California

HIGHLIGHTS: A balanced approach of structural and non-structural flood-reduction techniques is implemented through Federal, state, and local cooperation. This has been referred to as a "living river strategy."

BACKGROUND

Napa City and County, California have a history of periodic flooding from the Napa River and Napa Creek. At one time, the Napa River supported a dense riparian forest, provided significant wetland habitats alongside the River, and included productive spawning areas for fish such as the salmon and steelhead. However, the pressures of urbanization, agriculture, and grazing have degraded these habitats and the quality of the natural environment around the River.

Residents, businesses, local and State government, the Chamber of Commerce, environmental groups, the wineries, and the USACE joined to form a coalition and agreed to five goals:

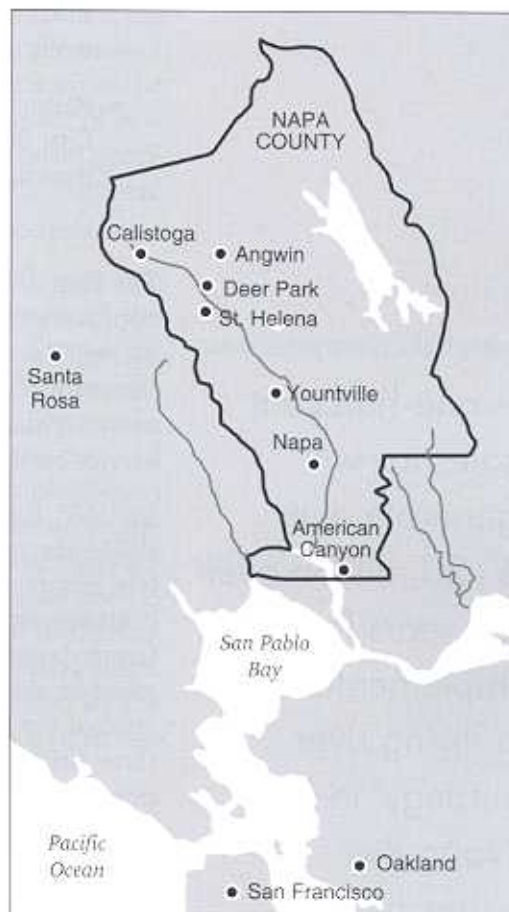
- Achieve "100-year" flood protection
- Restore the living environment of the Napa River
- Enhance the opportunity for economic development
- Develop a local financing plan that the community could support
- Develop a plan that addresses the entire watershed, County-wide

PROJECT ACCOMPLISHMENTS

The Project, now officially called the Napa County Flood Protection and Watershed Improvement Project, will provide flood protection by reconnecting the Napa River to its floodplain, creating wetlands throughout the area, maintaining fish and wildlife habitats, and retaining the natural characteristics of the River. The Project features will include the following:

- Lower or remove the dike south of Imola Avenue to allow the Napa River to flow in a wider area, thereby increasing conveyance capacity and reducing upstream water surface elevations.
- Modify the channel to create flood terraces, which will create additional capacity along the River and lower water surface elevations, contributing to the approximately 500 acres of created wetland and upland habitat.

Appendix B CASE STUDIES



The existing natural drainage system provided by the Napa River and Napa Creek is not adequate to prevent extensive flooding and associated property damage. In the past 36 years, the Napa County residents have sustained \$542 million in property damage alone, and the City of Napa experienced 27 major floods from 1862 to 1997.

A one-half cent sales tax will generate over \$120 million over 20 years for the implementation of a "living river strategy" in the Napa River watershed.

- Develop a "dry" bypass channel to bridge the Oxbow. This bypass will allow low water flows to remain in the Oxbow, and help maintain natural characteristics. During flood flows, water will be diverted out of the Oxbow and onto a more direct route through central Napa.
- Construct new dikes, levees, and floodwalls to contain the "100-year" flood event. Three pump stations will remove water from behind floodwalls and levees and pump the water into the Napa River.
- Removal and replacement of a number of bridges in downtown Napa City. Replaced bridges will be designed with higher clearances to better pass flood flows.
- Reduce dredging and return tidal influence to historic baylands.

The Plan is estimated to cost \$220 million. In 1998, the voters of Napa County approved a half-cent sales tax increase for 20 years to help fund the improvements. The \$6 million per year sales tax revenue will enable plan implementation, which is projected to result in an annual savings of \$26 million in avoided property damage, reduced insurance costs, avoided cleanup and emergency service costs, and enhanced environmental improvements.

In 1997, the Governor's Office of Emergency Services awarded \$7 million in FEMA Hazard Mitigation Grant Program funding for the acquisition of 90 mobile home park units and 7 homes on Napa Creek, as well as construction of drainage improvements. FEMA also provided funds for elevation of 70 single-family homes, and the California Department of Water Resources provided a grant for the purchase of a non-residential parcel in the floodplain. The City has applied for \$20 million from the Federal Highway Administration to replace three bridges, and the USACE will be responsible for the design and construction of 13 additional bridges. CALFED, a conglomerate formed in 1994 of California State and Federal agencies with management and regulatory responsibility in the Bay-Delta Estuary are providing grants, in conjunction with the Coastal Conservancy. These CALFED grants will be used to acquire land and remove levees for the floodplain. Additional grants are being sought for door dams in Napa City, and for elevation of homes in St. Helena, Yountville, and unincorporated parts of the County.

Darlington, Wisconsin

PROJECT NAME: Historic Structures and Community Development

LOCATION: Darlington, Wisconsin

HIGHLIGHTS: A Community balances considerations of Historic Preservation, economic development, hazardous materials, and aesthetics with flood reduction actions and restoration of open space in the floodplain.

BACKGROUND

Mitigation measures must be designed to unite flood reduction and preservation of a community's resources. Protecting historic structures located in high-risk areas provides a unique challenge to flood reduction.

Such is the case in the City of Darlington, located in the southwestern part of Wisconsin in an area of rugged hills, ridges, and river valleys. Located on the slopes of the Pecatonica River, the downtown area is crossed by the river, which has a well-defined floodplain, and several community parks located along the riverfront.

The city was settled in the 1850s as a commercial point along an early trade route between Galena, Illinois and Mineral Point, Wisconsin. The downtown area has several buildings of architectural and historical significance such as the Lafayette County Courthouse, which has been on the National Register of Historic Places since 1978. In 1994, the State Historical Society of Wisconsin nominated Darlington's historic Main Street Central Business District to the National Register of Historic Places.

The City of Darlington experienced flooding in 1950, 1959, 1969, 1990, and 1993, with the 1990 flood event being one of the worst. Rushing waters from the swollen Pecatonica River washed out bridges and roads, and caused extensive crop damage, damage to dozens of homes and businesses, sewer back-up, debris build-up in streams, power outages, and damage to the area's hiking trails. High water levels forced the closing of all major highways into the city and created islands of high ground. Several fuel and chemical storage tanks, which are located along the River, were damaged and damage was reported at the city's wastewater treatment plant. In the historical downtown area, approximately 30 businesses were damaged, and flooding was so severe that several downtown residents had to be evacuated by motorboat. Outside of the downtown area, homes were inundated as flood waters rose 7 feet above flood stage. In all, the damages in Darlington during the 1990 flood event accounted for the vast majority of damages experienced in Lafayette County, which totaled approximately \$2.8 million.

PROJECT ACCOMPLISHMENTS

Darlington's history of flooding and associated damages indicates that mitigation measures would be appropriate and could end the cycle of repetitive flood damage. After the 1993 flood, the City of Darlington decided to undertake an extensive flood mitigation project. The project involved the following elements:

- Floodproofing 12 structures in the downtown area, and acquisition and relocation of 15 additional structures. The floodproofing consisted of filling the basements with sand and suitable fill, elevating the first floors, constructing vestibules, and installing removable floodshields. Floodshields in the interiors of the buildings would allow water to infiltrate the vestibules. The vestibules were constructed with drainholes and made of material that can easily be hosed down after a major flood. These floodproofing designs conformed to the Secretary of the Interior's Standards for Building Rehabilitation and Guidelines for Rehabilitating Historic Homes, and the floodplain management requirements of the State of Wisconsin Natural Resource Code 116.
- Development of a business park on a 35-acre parcel south of Darlington using Economic Development Administration funds to

provide the necessary infrastructure (a water main, gravity sewer and force main, on-site sewage lift station, an access road and drainage improvements). After completion of these improvements, several of the businesses in the flood prone areas of the city that were acquired were moved to this parcel for the business park.

- Conversion of the acquired land near the river to a park and campground.
- Federal, state, and local outlays for the mitigation project totaled \$3.4 million representing 78 percent of total project funds (58 percent came from FEMA, and 20 percent from the Economic Development Administration). The remainder of the funds for the project came from State and local contributions, as well as from local financial institutions and the resources of local property owners.

In addition to the reduction in potential damages, this mitigation project produced a number of other indirect benefits. Darlington's environment was made safer, its aesthetic quality was heightened, the natural function of the floodplain was restored, and the city's economic development potential was increased. For example:

- By relocating many of the storage tanks and distribution systems for fuel oil, propane, and natural gas, the flooding threat to these resources has been almost entirely eliminated. This has significantly reduced the potential for pollution or explosion associated with these sites.
- Businesses that use and maintain varying quantities of hazardous materials were relocated outside the floodplain, thereby eliminating the threat of hazardous material dispersion by floodwaters.
- The removal of structures and associated materials from the floodplain reduced the potential for dangerous floating debris during floods.
- The open space created by removal of structures from the floodplain increased the area's aesthetic quality and created recreational opportunities. This has benefited not only the look of the downtown area, but has also increased the economic potential of nearby businesses, since the improved downtown area is now more attractive to shoppers and store patrons.

Baltimore County, Maryland

PROJECT NAME: Integrated Watershed Management Program

LOCATION: Baltimore County, Maryland

BACKGROUND

The protection and restoration of the natural functions and values of floodplains in Baltimore County are achieved through several components of the County's Integrated Watershed Management Program. This program evolved from initiatives taken by the County to respond to growth management and

environmental issues that arose following a period of rapid suburbanization from the 1950s through the 1970s, during which the population of the County grew by nearly 130 percent. Today, Baltimore County's 2,150 miles of streams are a major focus of the Program, which has been implemented since the 1987 formation of the Department of Environmental Protection and Resource Management (DEPRM). The County's Integrated Watershed Management Program is a coordinated set of aggressive programs for growth management and land conservation, resource protection/regulation, restoration, facility maintenance, watershed monitoring, research and planning, and education and citizen participation.

As was typical of most of Maryland's counties, Baltimore County's initial concern regarding impacts of floodplain use was with respect to property damage following significant flooding events. Subsequent to damage from Hurricane Agnes in June 1972 and other severe storms of the 1970s, the County spent more than \$10 million to remove buildings that were previously constructed in floodplains. In 1982, the County enacted Development Regulations that included provisions for grading and sediment control, floodplain and wetland protection, drainage (stormwater management), slope and soil protection, and preservation of natural and historical features. The experience of implementing regulations without the benefit of an integrated environmental impact review program and detailed technical guidance for regulatory decision-making led to efforts by DEPRM to re-evaluate the County's regulations from a functional ecosystem perspective.

Baltimore County's approach to the protecting of the natural functions and values of floodplains grew from the attempt to implement the requirements of the 1982 Development Regulations. These regulations established the intent to protect ecosystem functions of stream systems, but provided inadequate design standards. In 1986, the County established a Water Quality Policy that included 50-foot riparian buffers for all land development projects. With the establishment of DEPRM in 1987, the County focused on providing the technical basis for an integrated environmental impact review of development activity. The development of Baltimore County's "stream buffer" regulations was guided initially by the County's Water Quality Steering Committee, which recommended regulatory protection in 1988. In June 1989, an Executive Order was issued entitled *Regulations for the Protection of Water Quality, Streams, Wetlands and Floodplains*. These regulations established the County's intent to implement the national policy for the restoration and maintenance of the chemical, physical, and biological integrity of waters as embodied in the Clean Water Act of 1977. The stream buffer provisions were amended in 1990 to include protec-



"Loch Raven" by Rachel Bakalyar, age 16, Good Shepherd School, Baltimore, Maryland. 2001 National Art Finalist, River of Words Contest®

©River of Words

tion of steep and erodible slopes adjacent to watercourses, and the revised Regulations became effective in January 1991. The County's Regulations have been cited by the State of Maryland and the Chesapeake Bay Program as a model for local stream protection.

Several characteristics of the stream buffers established through the Regulations are noteworthy:

1. The buffer requirements apply to all land "development" activity, including grading, land subdivision, and construction.
2. Stream buffers are required for all perennial and intermittent streams based on field-determined site conditions, including delineation of stream channels, non-tidal wetlands and floodplains.
3. The stream buffer design standards account for water quality class and stream hierarchy, with variable widths, including a minimum of 75 feet on each side of the stream for non-trout waters and 100 feet for trout streams; or, 25 feet beyond the extent of "100-year" floodplains/ non-tidal wetlands; or steep/erodible slopes within 150 feet of the stream, whichever is greatest.
4. Stream buffers must be surveyed and recorded on Record Plats, and restrictive covenants designed to prevent disturbance of vegetation are required.

Other components of DEPRM's Integrated Watershed Management Program also address the protection and restoration of the natural functions and values of floodplains.

- **Restoration.** In 1987, DEPRM established a capital improvement program for watershed restoration, funded through County bond funds and State cost-share programs. For severely degraded streams, the county is undertaking restoration of channels using "natural channel design" concepts based on Rosgen methods. These projects involve restoration of the dimension, pattern, and profile of streams, often with re-creation of functional floodplains where channels were previously deeply incised. Replanting of wetlands in the floodplain and reforestation of the riparian zone are important components of these projects.

Baltimore County also launched a new program in the spring of 1999 for community reforestation that is focusing on riparian areas. A collaborative effort of DEPRM and the Department of Recreation and Parks, the program includes a contract with a non-profit AmeriCorps-affiliated youth service organization for planting, monitoring, and maintenance of community reforestation projects. The County's Forestry Board is contributing grant funding for the purchase of trees and is establishing seedling nurseries in County schools.

- **Research and Planning.** DEPRM is conducting significant research to guide decision-making for watershed-based resource management. This effort includes the preparation of watershed

management plans for the characterization of water quality problems and identification of priorities for restoration. The plans typically include a watershed water quality model such as the EPA Storm Water Management Model (SWMM) for existing and future land use, and evaluation of stream channel stability using the Rosgen stream classification method. Additional research has included the development of regional curves for geomorphic relationships of local Piedmont streams. The DEPRM also completed research for a project entitled *A GIS-based Methodology for Establishing Greenway Corridors in a Fragmented Forest Landscape*. This project is a tool for the assessment of the County's forest patches and the identification of priorities for both conservation and for reforestation of riparian corridors and gaps. The DEPRM is also starting work on a 2-year study funded by the Water Environment Research Foundation on the effectiveness of riparian buffers in urbanized areas for water quality, stream channel stability, and habitat.

PROJECT ACCOMPLISHMENTS

Baltimore County has developed an Integrated Watershed Management Program that addresses Federal nonpoint source pollution control mandates, State of Maryland initiatives for restoration of the Chesapeake Bay, and local priorities and cooperative water quality projects. The DEPRM has used a multi-functional, watershed-based approach for the protection of its resources, including the ecosystem functions of floodplains. To date, DEPRM's programs have accomplished the following:

- **Resource Protection/Regulation.** The County's *Regulations for the Protection of Water Quality, Streams, Wetlands and Floodplains* have been applied to an estimated 1,700 land development projects. In combination with other resource protection programs such as Storm Water Management and Forest Conservation, the regulations are protecting the integrity of stream corridors, even in the densest planned town centers. Studies to evaluate the effectiveness of these programs are underway.
- **Restoration.** The DEPRM has completed nearly a dozen stream restoration projects, many of which involved re-creation or enhancement of functioning floodplains. More than 18 additional projects are in the design, permitting, or construction phase. Although new, the County's community reforestation program has already included several urban and rural riparian reforestation projects that include planting of floodplains.
- **Research and Planning.** The DEPRM has completed watershed management plans for 4 of its 14 major watersheds, with 3 other plans nearing completion and 2 additional plans recently underway. The County has invested more than \$1 million through these studies to guide decision-making for resource management.

In all of these efforts, Baltimore County works closely with Federal, regional and state agencies, neighboring jurisdictions, non-profit organizations, and commu-

nity-based water shed associations. The County's commitment to protection and restoration of its natural resources has been acknowledged through several awards from the Local Government Advisory Committee of the Chesapeake Bay Program.

Oregon and Washington

PROJECT NAME: Managing Northwest U.S. River Systems to Reduce Flood Damage and Restore Watershed Health

LOCATION: Washington and Oregon

HIGHLIGHTS: Partnerships, planning, and technical assistance ensure flood management with highest fish and wildlife habitat values



Storm damage in Umatilla.

BACKGROUND

Oregon and Washington experienced its worst flooding in 35 years during the winters of 1995-1997. These floods devastated significant portions of these states, resulting in disaster declarations for over half of Oregon and 30 counties in Washington. On May 20, 1996, the White House approved \$1.6 million for the U.S. Fish and Wildlife Service to provide technical assistance in Oregon, Idaho, Washington, and California to landowners and Federal agencies such as the Natural Resource Conservation Service (NRCS) and Army Corps of Engineers (USACE). This 1996 appropriation was supplemented after additional flooding occurred in late 1996 and early 1997.

In Oregon, the 1997 floods were mostly concentrated in the southwestern and northeastern parts of the state, while the February 1996 flood occurred on the north Oregon coast and in the Willamette Valley. In Washington, several rivers with chronic watershed damage experienced repeated flooding in 1997 during relatively normal rain and snowmelt events. Much of the damage was from flooding of urbanized areas, residential and commercial properties, and farms and associated structures located within floodplains.

Floodplains have traditionally been used for farming, but recent growth pressures have also led to increased development for industrial and residential purposes. In addition to flooding, these storm events also caused landslides, streambank erosion, and significant amounts of sediment transport.

PROJECT ACCOMPLISHMENTS

The USFWS's flood response program focused on the following areas:

- **Technical Assistance** was provided to over 630 flood-related projects in Oregon and Washington during 1996 and 1997. In Oregon, this assistance was delivered in all counties but one. In Washington, assistance was concentrated in the western portion of the

state where flooding was most severe. Much of this work occurred in river systems with sensitive fish species, and special emphasis was given to maintaining or restoring important habitat conditions for these species. This approach maximized benefits to fish and wildlife while minimizing cost and inconvenience to the landowner, and in many cases actually resulted in a simplified permitting process because resource considerations were incorporated early in the process.

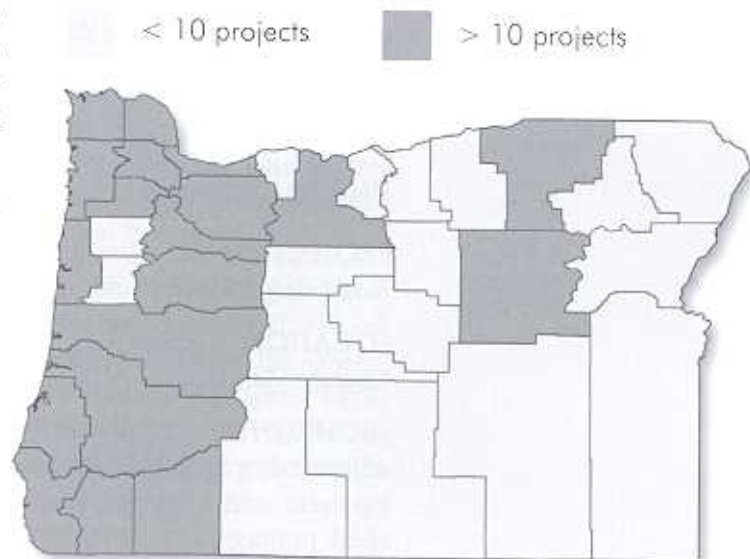
- **A Flood Control Techniques Report** is being prepared in consultation with partner agencies to address a variety of stream bank stabilization methods to determine which flood management techniques provide the highest quality fish and wildlife habitat. Over 100 requests for this report have been received to date. There is also an interagency effort to re-define how vegetation is managed on levees to provide for both flood protection and habitat. The results of these two projects will be available to Federal, state, and local watershed managers. Using "fish friendly" flood management techniques are becoming increasingly critical as Washington and Oregon intensify their salmon recovery programs.

- **The Tillamook Basin Flood Study** is developing an integrated river management strategy for the entire basin. Over the previous century, a traditional philosophy of damming, diking and dredging had prevailed. Unfortunately, these and other flood engineering activities were often at cross-purposes to salmon and wetland restoration efforts.

President Clinton, in Challenge 21 of his 1998 Clean Water Action Plan, authorized the USACE "to work with local communities to promote greater use of non-traditional, non-structural flood hazard mitigation strategies through increased fiscal and policy incentives." The Tillamook Basin Study supports this approach, and the USACE has identified the basin as a Challenge 21 project. The goal is to develop a management strategy that accommodates appropriate human uses of floodplain areas while conserving and restoring important aquatic resources. When completed, it is expected that the Tillamook example will be used by watershed councils and other planning bodies as a benchmark for similar floodplain management and restoration strategies throughout Oregon.

- **Partnerships.** The third accomplishment of the flood response program involves creating and strengthening partnerships. The U.S. Fish and Wildlife biologists spent the majority of their time working

Service Provided in Oregon



in the field with private landowners, Soil and Water Conservation District representatives, city and county officials, Native American tribes, and state and Federal agencies such as the Oregon Department of Agriculture and NRCS. Much of this work focused on reviewing landowner needs, project plans, potential impacts of various alternatives, easement opportunities, and permitting and funding options. In 1997, for example, the NRCS received \$2.2 million for purchase of floodplain easements in Oregon.

Providing on-the-ground assistance in a reliable and productive manner resulted in more invitations from landowners and agencies for early involvement in the restoration projects. Examples include the Skokomish, Dungeness, and Skagit watersheds in Washington, which were targeted to long-term solutions for preventing repeated flooding and habitat destruction. Restoring watershed health will reduce flooding and the expense of repeatedly repairing flood damaged structures while also restoring important spawning and rearing habitat for declining salmon stocks.

The Northwest U.S. River Systems program is noteworthy in that it is creating partnerships among the stakeholders in the affected basins; restoring the natural floodplain and salmon habitat; developing plans for large areas; and committing significant funds and technical assistance to make the program a reality.

Prince George's County, Maryland

PROJECT NAME: Residential Flood Response Planning

LOCATION: Prince George's County, Maryland

HIGHLIGHTS: County driven efforts to implement flood management and integrate watershed management, planning, and effective mitigation techniques.

BACKGROUND

Prince George's County sustained significant flooding in 1972 following Hurricane Agnes. More than \$10 million in damages resulted from the storm. As a result, the County enacted a bill in August, 1972 (CR 126-1972) establishing a Task Force on Flooding to review available data on flood control projects, recommend immediate and long-term actions for alleviating flooding problems, and review the County's flood emergency procedure. The County's program is structured to include the principles of community involvement, education, and media relations.

Following two years of much discussion and study, the Task Force recommended the following:



Relocating a Prince George's County home.

C. Oliver

- Recognize the importance of floodplains as natural resources and call for the preservation of floodplains essentially in their natural state;
- Recognize the desirability of developing a comprehensive County-wide Stormwater Management Program to integrate watershed planning and implementation;
- Recognize the need to strengthen interagency coordination in stormwater management planning and implementation; and
- Advocate strengthening of the County's capabilities in dealing with existing developments within floodplains.

As a result of the Task Force Report, the County significantly revised the County Floodplain Management Ordinance (CB-30-1975) regulating all activities within the County floodplain areas.

The State Flood Management Act (Natural Resources Article 8-9A-01 et seq., 1976) requires that watershed management studies be conducted to address the magnitude of flood problems and alternative management techniques minimizing flood damage. In response to the Act and the need to protect lives and property, the County subsequently created an Interagency Technical Group in December 1977 to study watersheds in the County. The Interagency Group consisted of representatives from the area water and sewer utility, the Washington Suburban Sanitary Commission, the Maryland-National Park and Planning Commission, and the County's Department of Environmental Resources.

Institutionally, a number of changes were made as a result of the Task Force and Interagency Group recommendations. Watershed studies were conducted; a Flood Management Watershed Protection Branch was established within the Watershed Protection Branch in 1987; and the County revised its Floodplain Ordinance to continue participation in the National Flood Insurance Program, in order to retain eligibility for Federal and State financial assistance and disaster relief.

The County established five (5) goals against which it adopted various action plans:

1. Reduce or eliminate existing flood hazards
2. Prevent future flood hazards from developing
3. Reduce the economic losses associated with flooding events
4. Restore, preserve, and enhance environmental quality
5. Improve the quality of life and provide for expanded recreational opportunities

PROJECT ACCOMPLISHMENTS

The information used to establish flood problem areas are citizen complaints and watershed studies. The County's program can be broadly divided into two categories: correcting existing problems and preventing future problems.

Correcting Existing Problems – The identification of problem areas within the county was done through two mechanisms. The first is from the average number of 350 storm-drainage complaints received each year, most of which are flood related. The second mechanism is through watershed studies, where more than 2,000 flood-prone structures have been classified. One project, Silver Valley Way, is an example of a plan initiated from a citizen complaint. Clinton Acres, on the other hand, was implemented after the Piscataway Watershed Study was completed. Both projects were funded by the State through the Flood Management Grant Program.

- **Silver Valley Way Project.** Citizens had complained to the County that they were experiencing flooding in their community. The study indicated the problem to be inadequate capacity of an existing 54-inch culvert under Interstate 95 that produced excessive water surface conditions. Two homes were acquired and one home was floodproofed. The acquisition of the homes restored an important property back to its natural state as a floodplain and was a complement to the other improvements.
- **Clinton Acres Subdivision.** In 1986, the County completed a Comprehensive Stormwater Management Plan for the Piscataway Creek Watershed. In the study, 38 houses in the Clinton Acres Subdivision in Brandywine were identified as flood-prone structures. Under the County Executive's request, a Citizen Advisory Committee (CAC) was formed consisting of county officials, directly affected residents, and indirectly affected residents, to develop the best solutions for solving the flooding problem. After a detailed evaluation and numerous lengthy meetings, the CAC reached a consensus that acquisition and floodproofing were the most desirable solutions. The CAC then developed a policy for the acquisition and floodproofing of flood-prone homes. With this policy, the County initiated the acquisition and floodproofing program within the subdivision.

Watershed Studies – The County's watershed studies delineated the 2, 10, 100 and "500-year" floodplain elevations, based upon both present and ultimate development conditions within the watershed. The resulting plan identified floodplains, present and future flood hazards, and water quality requirements. Once an area has been identified as flood-prone, the County requires that all future development not increase the 2, 10, or "100-year" water surface elevations in flood prone zones. This is accomplished through individual, on-site, or regional control measures. The County continues to be successful in requiring developers to reduce post development discharge to a level equal to or less than predevelopment conditions. The County has also developed a matrix to assist planners in determining how each flood-prone structure should be treated in developing long range floodproofing and acquisition plans. The decision matrix takes into account the development density, flood depth, number of affected homes, and if livable space is affected. As the density and home number increases, acquisition is viewed as more viable. With the converse, floodproofing is preferred. After the above information is tallied, a comprehensive flood hazard mitigation plan is proposed.

- **Acquisition Process.** Once a home is identified for acquisition, County personnel meet with the homeowner, walk through the house and mark flood elevations, explain the negative effects of repetitive or long-term flooding, and present the County's voluntary acquisition process. A determination is made as to whether the structure can be relocated to an acceptable nearby lot. Otherwise the structure is demolished and the lot graded and stabilized. The lots accrue to the County inventory, the park system, or to interested adjacent property owners. Deed restrictions are placed on the property to prevent future building on the property.
- **Floodproofing.** Floodproofing parallels the acquisition process in the initial stages. The County designs, constructs, and pays for the floodproofing. The improvements are designed to create an amenity to the property and employ low walls, earth berms, grading, or stairs.
- **Preventing Future Problems.** Basically, no development is permitted within the County floodplain. Filling or other encroachments into a designated floodplain are generally prohibited, unless the project can offset or mitigate impacts to the floodplain.

Santa Clara River Valley, California

PROJECT NAME: Santa Clara River Enhancement and Management Plan

LOCATION: Santa Clara, California

HIGHLIGHTS: Stakeholder involvement provides a plan to manage an entire river corridor.

BACKGROUND

The Santa Clara River is the only large river left in southern California that remains mostly in its natural state. As such, it represents a unique value to a wide variety of residents in a watershed that lies north of the City of Los Angeles. In 1992, stakeholders including the agricultural community, aggregate community, development interests, local government, water and sanitation districts, private landowners, recreation agencies, and State and Federal resource and regulatory agencies, held competing interests on the use and protection of the River's resources. There was consensus however, that some orderly process and plan was necessary. The goal was to develop a plan for the "500-year" floodplain that was amenable to all parties that would be implemented to ensure that the Santa Clara River remained a natural and economic resource of the River valley. The following table of stakeholders and their concerns gives some idea of the challenges that developing a functional plan posed.

PROJECT ACCOMPLISHMENTS

Project Steering Committee – After much discussion, the stakeholders agreed to develop a plan and form a Project Steering Committee to advance the process. The charge of the 26 member Committee was to develop and seek support



The Newhall Land and Farming Company

Stakeholders of the Santa Clara River Valley have developed an enhancement and management plan for the largely pristine floodplain to ensure that the river remains a natural and economic resource for the community.

for a dynamic, long-ranged Enhancement and Management Plan for the Santa Clara River. Secondly, the study process will focus on improving coordination and information exchanges among all Project Steering Committee members and on resolving conflicting uses along the River. The study is designed to give balanced consideration to protection of the natural and beneficial functions of the floodplain, natural river processes, private property rights, economic interests, and community objectives. The vision statement of the Committee is to achieve:

"A River corridor that is an asset to all those who work and live in the Santa Clara River Valley; one that provides for a positive, coordinated interaction among all stakeholders along the River."

The development of the Santa Clara River Plan represents an innovative approach in that it gathers all involved parties and stakeholders together to develop a plan not only for floodplain management, but also for management of the entire River corridor for all purposes. Approaches such as this, if successful, will establish objectives and priorities as well as avoid the gridlock that occurs

STAKEHOLDER	CONCERN
California Department of Fish and Game US Fish and Wildlife Service	Long term protection for Federally listed and rare species and habitats on the River; maintenance of a natural and dynamic river
Los Angeles Flood Control District Ventura County Flood Control District	Increased flood control to land at risk on the River
Newhall Land and Farming Company	Construct a city of 70,000 people in Los Angeles County
United Water Conservation District	Release more water from Piru reservoir for groundwater recharge to combat salt water intrusion underneath Oxnard Plain
Private Landowners	Simplified process for getting local, State and Federal permits for agricultural-related activities
Sand and Gravel Interests	Long-term availability of aggregate supplies from the River and its floodplain
Beach Erosion Authority	More sand supply for beach nourishment south of the River's mouth
Five Cities and Two Counties Along the River	Increased protection to infrastructure on and adjacent to the River; increased recreational opportunities
Regional Water Quality Control Board	Assure improvement and continued quality of water in the River

when competing positions are not addressed. By its very nature, this approach educates stakeholders on the interests of other stakeholders. For example, The Ventura County Flood Control District was considering using the Plan as a vehicle to convince the County not to permit development in flood prone areas.

In April 1999, the Project Steering Committee determined that the evaluation of issues and development of recommendations was complete and began discussing preparation of the final Plan.

Plan Development – The Santa Clara Enhancement and Management Plan is being developed in three phases:

- PHASE I** Collection and review of all existing information, which has been completed.
- PHASE II** Analysis of the information and development of alternative programs.
- PHASE III** Selection of a preferred alternative and performance of required environmental analyses.

Financial Support – Support for the Plan is originating from a number of sources, and will be in the form of grants and in-kind services.

Grants are coming from local, State and Federal governments including the State Coastal Conservancy, Wildlife Conservation Board of the State Department of Fish and Game, Los Angeles and Ventura County Flood Control Districts, U.S. Fish and Wildlife Service, and the U.S. Environmental Protection Agency.

The organizations that have offered in-kind services include the Newhall Land and Farming Company for mapping, Ventura and Los Angeles Counties for GIS and modeling, CalTrans (California Department of Transportation) for certain topographic mapping, United Water Conservation District for water studies, U.S. Fish and Wildlife Service for coordination, National Park Service for technical assistance on recreation, and the State Coastal Conservancy for various services.

Staten Island Wetlands, New York

PROJECT NAME: Bluebelt Streams, Ponds, and Other Wetland Areas Used as Ecologically Sound and Cost-Effective Storm Water Management

LOCATION: Staten Island, New York

HIGHLIGHTS: Effective community outreach and comprehensive approach to protecting and enhancing wetlands provides for a natural alternative for stormwater management.

BACKGROUND

South Richmond, Staten Island, the most southerly part of New York City and State, is the last area within city boundaries to have a significant amount of open space. It is separated from New Jersey on the west by a narrow body of water, the Arthur Kill. On the south and east is an arm of the Atlantic Ocean

called the Raritan Bay. To the north is the Fresh Kills Landfill, ignominiously known as the world's largest landfill.

South Richmond is also the last, large section of New York City that does not have sewers. Because of the lack of sewers, development has employed on-site storm water systems like septic tanks and package treatment plants, and on-site storm water management measures like dry wells and retention basins. Unfortunately, these systems often prove to be inadequate, leading to the current conditions of local flooding, degraded water quality, erosion, and negatively impacted wetlands.

In 1975, the city enacted the Special South Richmond Development District to preserve the area's low-density, open character. To achieve the goals of preserving natural features such as ponds and streams, an Open Space network (OSN) of nearly 700 acres was designated to remain in its natural state. It was determined that the OSN should be used as a storm water management system.

Following the creation of the OSN, the New York State Department of Environmental Conservation began regulating development in an extensive system of freshwater and tidal wetlands in South Richmond. During the 1980s, the state issued a series of maps for the freshwater wetlands on Staten Island, which include the streams and ponds of importance for storm water management. The ongoing regulatory program has preserved wetland areas that are significant to the overall drainage system.

In 1990, the New York City Department of Environmental Protection (DEP) created the Staten Island Bluebelt unit, and a major effort began to acquire wetland properties in order to complete the continuity of the stream corridors and other wetlands in the OSN. In 1995, DEP began redesigning the storm and sanitary sewer drainage plan to respect and utilize the area's natural features. The following goals were established by the DEP:

- Development of a comprehensive stormwater management system, which utilizes streams, ponds, and other areas to channel, store, and filter storm water.
- Use of urban Best Management Practices (BMPs) to reduce peak discharges, improve water quality and enhance aesthetics.
- Preservation and enhancement of ecosystems in the area for wildlife and open space.
- Unification between the constructed elements and the natural elements of the storm water management system, with an emphasis on complementing the rustic, pastoral, and historic characteristics of the surrounding area.
- Securing state designated Bluebelt sites from dumping and vandalism.

Westernport, Maryland

PROJECT NAME: Westernport Flood Mitigation Project

LOCATION: Westernport, Maryland

HIGHLIGHTS: Extraordinary cooperation leads to successful community planning efforts that reduce flood losses and restore stream health.

BACKGROUND

On September 6, 1996, Hurricane Fran deposited 7 inches of rain on the Georges Creek watershed in Allegany County, Maryland (a Project Impact Community.) The result was devastating floods that literally ripped apart many homes located in the steeply sloped mountain valley. Particularly devastated was the town of Westernport, located at the confluence of Georges Creek and the Potomac River. Over 10 homes along the Front Street and Main Street Extended area were rendered structurally unsound, with a dozen more seriously flooded. In addition, the embankment of Maryland Route 36 was eroded, and sections of the sanitary sewer were washed away or clogged with debris.

Allegany County was subsequently declared a Federal Disaster Area, the third of three declarations occurring in less than 12 months. Although the declaration brought needed financial assistance from FEMA and NRCS to remove debris from the stream, there were no readily available funds to assist those homeowners who wished to relocate permanently out of the floodplain. Being a small town in an economically limited area, Westernport had no financial resources to address this problem.

A team led by engineers from Allegany County, Maryland, Maryland State Highway Administration (SHA), and USDA Natural Resources Conservation Service (NRCS) began working with the Town to develop, secure funding, design, and construct the Westernport Flood Mitigation Project. The \$2.5 million project involved the purchase and removal of 27 homes from the floodplain, construction of streambank retaining walls to protect a major highway, repair and relocation of sanitary sewers, and restoration of the stream and riparian areas for a one-half mile section of Georges Creek.

The town then initiated a second phase in their Flood Recovery Program – a community planning effort to identify open space uses and activities for the buyout area. At the Town's request, the Rivers, Trails, and Conservation Assistance Program (RTCA) of the National Park Service joined the planning team to assist in the coordination, development and implementation of a Floodplain Park Concept Plan. The town implemented a community-based planning approach, which included community workshops, citizen surveys, interest group meetings, outreach through the local media, and the development of a local steering committee to oversee plan development.

In October 1996, a team led by the chief engineers of Allegany County, SHA, and NRCS convened meetings with other government entities and town representatives to develop ways to pool resources, programs, and talents to assist Westernport. The following project goals were agreed upon:

1. Remove homes from the floodplain through a voluntary buyout program.
2. Utilize environmental treatment to restore Georges Creek to a stable form providing its maximum available flow capacity.
3. Provide for stabilization of Maryland Route 36.
4. Repair or relocate damaged sanitary sewer line.
5. Manage long-term use of the acquired floodplain and community open space.

PROJECT ACCOMPLISHMENTS

Funding for the estimated \$3 million project was made possible through innovative pilot programs developed by SHA and NRCS. It included redirecting funds from normal highway maintenance and stream clearing activities to property acquisition and stream restoration activities.

As construction work drew to a close, the issue of long-term management of the floodplain buyout area came to the forefront. Town leaders wanted to explore alternatives that would preserve the integrity of the stream restoration while affording citizens some use of the area. In addition, there was interest in involving area residents in decision-making, and in building local support for long-term floodplain open space protection. At the request of the Town, the National Park Service, Rivers, Trails, and Conservation Program (Rivers & Trails) joined the planning team to serve as coordinator for the open space planning phase of the project.

The planning team sponsored a series of community meetings, workshops, and public surveys to serve as a forum for citizens to contribute ideas to the planning process. The planning team was instrumental in helping the community evaluate options for use of the floodplain buyout area. In addition, the planning team was able to expand the network of partners, and link the town with additional public and private sources of funding and technical assistance.

By September 1998, a Final Concept Plan, including a detailed site plan for the Main Street Extended area, was endorsed by the Town Council that included the following:

- Areas for passive recreation, including a walking rail, pavilion, handicapped accessible picnic area, open area for lawn games, and related park amenities
- Outdoor educational facilities, including a nature trail, stream access area, shelter/ pavilion for arts, science and history classes, and interpretive signage explaining flood history and stream restoration goals.

Section 562 – Task Force on the Natural and Beneficial Functions of the Floodplain

(a) **Establishment** – There is hereby established an interagency task force to be known as the Task Force on Natural and Beneficial Functions of the Floodplain (in this section referred to as the “Task Force”).

(b) **Membership** – The Task Force shall be composed of 5 members, who shall be the designees of

- (1) the Under Secretary of Commerce for Oceans and Atmosphere;
- (2) the Director of the United States Fish and Wildlife Service;
- (3) the Administrator of the Environmental Protection Agency;
- (4) the Secretary of the Army, acting through the Chief of Engineers; and
- (5) the Director of the Federal Emergency Management Agency.

(c) **Duties** – The Task Force shall

- (1) conduct a study to
 - (A) identify the natural and beneficial functions of the floodplain that reduce flood-related losses; and
 - (B) develop recommendations on how to reduce flood losses by protecting the natural and beneficial functions of the floodplain; and
- (2) make the information and recommendations under sub-paragraphs (A) and (B) publicly available.

(d) **Noncompensation** – Members of the Task Force shall receive no additional pay by reason of their service on the Task Force.

(e) **Chairperson** – The members of the Task Force shall elect one member as chairperson of the Task Force.

(f) **Meetings and Actions** – The Task Force shall meet at the call of the chairperson or a majority of the members of the Task Force and may take action by a vote of the majority of the members. The Federal Insurance Administrator shall coordinate and call the initial meeting of the Task Force.

(g) **Officers** – The chairperson of the Task Force may appoint any officers to carry out the duties of the Task Force under subsection (c).

(h) **Staff of Federal Agencies** – Upon request of the chairperson of the Task Force, the head of any of the Federal agencies and entities referred to under subsection (b) may detail, on a nonreimbursable basis, any of the personnel of such agency to the Task Force to assist the Task Force in carrying out its duties under this section.

(i) **Powers** – In carrying out this section, the Task Force may hold hearings, sit and act at times and places, take testimony, receive evidence and assistance,

Appendix C SECTION 562 OF THE NATIONAL FLOOD INSURANCE REFORM ACT OF 1994

provide information, and conduct research as the Task Force considers appropriate.

(j) **Termination** - The Task Force shall terminate upon the expiration of the 24-month period beginning upon the designation of the last member to be designated under subsection (b).

Committee Report

Section 562 — Task Force on Natural and Beneficial Functions of the Floodplain

The Committee intends that the Director of FEMA, the Undersecretary of Commerce for Oceans and Atmosphere, the Director of the United States Fish and Wildlife Service, the Administrator of the United States Environmental Protection Agency, and the Secretary of the Army, shall serve on the Task Force on the Natural and Beneficial Functions of the Floodplain, which shall identify the natural and beneficial functions that reduce flood losses and make recommendations on how the nation can further reduce flood losses through the protection of the natural and beneficial functions of the floodplain.

In addition, the Conferees expect that the study will include a discussion of examples of the uses of natural floodplain management to reduce flood losses, and the status of, range of benefits associated with, and potential that may exist for protecting relatively natural floodplain functions. The study should also address tradeoffs and costs and benefits associated with such floodplain management approaches, the range of uses usually considered compatible with the protection of such floodplain functions, such as protecting water quality, recharging groundwater, and provision of habitat that may accompany protection of relatively undisturbed natural floodplains. In addition, the study should consider the appropriate roles of local, State, and Federal government agencies and the private sector in identifying, managing, and protecting such floodplain functions, how such approaches may relate to other approaches to reduce flood losses, and make recommendations for administrative and legislative initiatives to best utilize natural floodplain resources.

The Task Force is also encouraged, to the extent appropriate, to consult with other Departments and agencies, such as the National Park Service Rivers and Trails Program, State and local government officials and the private sector.

Floodplain Management

Statement by the President Accompanying Executive Order 11988. May 24, 1977

The floodplains that adjoin the Nation's inland and coastal waters have long been recognized as having special values to our citizens. They have provided us with wildlife habitat, agricultural and forest products, stable ecosystems, and park and recreation areas. However, unwise use and development of our riverine, coastal, and other floodplains not only destroy many of the special qualities of these areas but also pose a severe threat to human life, health, and property.

Since the adoption of a national flood damage reduction policy in 1936, the Federal Government has invested about \$10 billion in flood protection works. Despite substantial efforts by the Federal Government to reduce flood hazards and protect floodplains, annual losses from floods and adverse alteration of floodplains continue to increase.

The problem arises mainly from unwise use practices. The Federal Government can be responsible for or can influence these practices in the construction of projects, in the management of its own properties, in the provision of financial or technical assistance including support of financial institutions, and in the uses for which its agencies issue licenses or permits. In addition to minimizing the danger to human and nonhuman communities living in floodplains, active floodplain management represents sound business practice by reducing the risk of flood damage to properties benefiting from Federal assistance.

Because unwise floodplain development can lead to the loss of human and other natural resources, it is simply a bad Federal investment and should be avoided. In order to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative, I have issued an Executive Order on floodplain management.

Floodplain Management

Executive Order 11988. May 24, 1977

By virtue of the authority vested in me by the Constitution and statutes of the United States of America, and as President of the United States of America, in furtherance of the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 *et seq.*), the National Flood Insurance Act of 1968, as amended (42 U.S.C. 4001 *et seq.*), and the Flood Disaster Protection Act of 1973 (Public Law 93-234, 87 Stat. 975), in order to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative, it is hereby ordered as follows:



Appendix D PRESIDENTIAL EXECUTIVE ORDERS

Sec. 1. Each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

Sec. 2. In carrying out the activities described in Section I of this Order, each agency has a responsibility to evaluate the potential effects of any actions it may take in a floodplain; to ensure that its planning programs and budget requests reflect consideration of flood hazards and floodplain management; and to prescribe procedures to implement the policies and requirements of this Order, as follows:

(a)(1) Before taking an action, each agency shall determine whether the proposed action will occur in a floodplain-for major Federal actions significantly affecting the quality of the human environment, the evaluation required below will be included in any statement prepared under Section 102(2) (C) of the National Environmental Policy Act. This determination shall be made according to a Department of Housing and Urban Development (HUD) floodplain map or a more detailed map of an area, if available. If such maps are not available, the agency shall make a determination of the location of the floodplain based on the best available information. The Water Resources Council shall issue guidance on this information not later than October 1, 1977.

(2) If an agency has determined to, or proposes to, conduct, support, or allow an Action to be located in a floodplain, the agency shall consider alternatives to avoid adverse effects and incompatible development in the floodplains. If the head of the agency finds that the only practicable alternative consistent with the law and with the policy set forth in this Order requires siting in a floodplain, the agency shall, prior to taking action, (i) design or modify its action in order to minimize potential harm to or within the floodplain, consistent with regulations issued in accord with Section 2(d) of this Order, and (ii) prepare and circulate a notice containing an explanation of why the action is proposed to be located in the floodplain.

(3) For programs subject to the Office of Management and Budget Circular A-95, the agency shall send the notice, not to exceed three pages in length including a location map, to the State and area-wide A-95 clearinghouses for the geographic areas affected. The notice shall include: (i) the reasons why the action is proposed to be located in a floodplain; (ii) a statement indicating whether the action conforms to applicable State or local floodplain protection standards and (iii) a list of the alternatives considered. Agencies shall endeavor to allow a brief comment period prior to taking any action.

(4) Each agency shall also provide opportunity for early public review of any plans or proposals for actions in floodplains, in accordance with Section 2 (b) of

Executive Order No. 11514, as amended, including the development of procedures to accomplish this objective for Federal actions whose impact is not significant enough to require the preparation of an environmental impact statement under Section 102 (2) (C) of the National Environmental Policy Act of 1969, as amended.

(b) Any requests for new authorizations or appropriations transmitted to the Office of Management and Budget shall indicate, if an action to be proposed will be located in a floodplain, whether the proposed action is in accord with this Order.

(c) Each agency shall take floodplain management into account when formulating or evaluating any water and land use plans and shall require land and water resources use appropriate to the degree of hazard involved. Agencies shall include adequate provision for the evaluation and consideration of flood hazards in the regulations and operating procedures for the licenses, permits, loan or grants-in-aid programs that they administer. Agencies shall also encourage and provide appropriate guidance to applicants to evaluate the effects of their proposals in floodplains prior to submitting applications for Federal licenses, permits, loans or grants.

(d) As allowed by law, each agency shall issue or amend existing regulations and procedures within one year to comply with this Order. These procedures shall incorporate the Unified National Program for Floodplain Management of the Water Resources Council, and shall explain the means that the agency will employ to pursue the nonhazardous use of riverine, coastal and other floodplains in connection with the activities under its authority. To the extent possible, existing processes, such as those of the Council on Environmental Quality and the Water Resources Council, shall be utilized to fulfill the requirements of this Order. Agencies shall prepare their procedures in consultation with the Water Resources Council, the Federal Insurance Administration, and the Council on Environmental Quality, and shall update such procedures as necessary.

Sec. 3. In addition to the requirements of Section 2, agencies with responsibilities, for Federal real property and facilities shall take the following measures:

(a) The regulations and procedures established under Section 2(d) of this Order shall, at a minimum, require the construction of Federal structures and facilities to be in accordance with the standards and criteria and to be consistent with the intent of those promulgated under the National Flood Insurance Program. They shall deviate only to the extent that the standards of the Flood Insurance Program are demonstrably inappropriate for a given type of structure or facility.

(b) If after compliance with the requirements of this Order, new construction of structures or facilities are to be located in a floodplain, accepted floodproofing and other flood protection measures shall be applied to new construction or rehabilitation. To achieve flood protec-

tion, agencies shall, wherever practicable, elevate structures above the base flood level rather than filling in land.

(c) If property used by the general public has suffered flood damage or is located in an identified flood hazard area, the responsible agency shall provide on structures, and other places where appropriate, conspicuous delineation of past and probable water surface elevation in order to enhance public awareness of and knowledge about flood hazards.

(d) When property in floodplains is proposed for lease, easement, right-of-way, or disposal to non-Federal public or private parties, the Federal agency shall (1) reference in the conveyance those uses that are restricted under identified Federal, State, or local floodplain regulations; and (2) attach other appropriate restrictions to the uses of properties by the grantee or purchaser and any successors, except where prohibited by law; or (3) withhold such properties from conveyance.

Sec. 4. In addition to any responsibilities under this Order and Sections 202 and 205 of the Flood Disaster Protection Act of 1973, as amended (42 U.S.C. 4106 and 4128), agencies which guarantee, approve, regulate, or insure any financial transaction which is related to an area located in a floodplain shall, prior to completing action on such transaction, inform any private parties participating in the transaction of the hazards of locating structures in the floodplain.

Sec. 5. The head of each agency shall submit a report to the Council on Environmental Quality and to the Water Resources Council on June 30, 1978, regarding the status of their procedures and the impact of this Order on the agency's operations. Thereafter, the Water Resources Council shall periodically evaluate agency procedures and their effectiveness.

Sec. 6. As used in this Order:

(a) The term "agency" shall have the same meaning as the term "Executive agency" in Section 105 of Title 5 of the United States Code and shall include the military departments; the directives contained in this Order, however, are meant to apply only to those agencies which perform the activities described in Section I that are located in or affecting floodplain

(b) The term "base flood" shall mean that flood which has a one percent or greater chance of occurrence in any given year.

(c) The term "floodplain" shall mean the lowland and relatively flat areas adjoining inland and coastal waters including floodprone areas of offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year.

Sec. 7. Executive Order No. 11296 of August 10, 1966, is hereby revoked. All actions, procedures, and issuances taken under that Order and still in effect

shall remain in effect until modified by appropriate authority under the terms of this Order.

Sec. 8. Nothing in this Order shall apply to assistance provided for emergency work essential to save lives and protect property and public health and safety, performed pursuant to Sections 305 and 306 of the Disaster Relief Act of 1974 (88 Stat. 148,42 U.S.C. 5145 and 5146).

Sec. 9. To the extent the provisions of Section 2(a) of this Order are applicable to projects covered by Section JG4(h) of the Housing and Community Development Act of 1974, as amended (88 Stat. 640, 42 U.S.C. 5304 (h)), the responsibilities under those provisions may be assumed by the appropriate applicant, if the applicant has also assumed, with respect to such projects, all of the responsibilities for environmental review, decision-making, and action pursuant to the National Environmental Policy Act of 1969, as amended.

The White House,
May 24, 1977
JIMMY CARTER

Protection of Wetlands

Statement by the President Accompanying Executive Order 11990. May 24, 1977

The Nation's coastal and inland wetlands are vital natural resources of critical importance to the people of this country. Wetlands are areas of great natural production, and habitat for fish and wildlife resource. Wetlands contribute to the production of agricultural products and timber, and provide recreational, scientific, and aesthetic resources of national interest.

The unwise use and development of wetlands will destroy many of their special qualities and important natural functions. Recent estimates indicate that the United States has already lost over 40 percent of our 120 million acres of wetlands inventoried in the 1950's. This piecemeal alteration and destruction of wetlands through draining, dredging, filling, and other means has had an adverse cumulative impact on our natural resources and on the quality of human life.

The problem of loss of wetlands arises mainly from unwise land use practices. The Federal Government can be responsible for or can influence these practices in the construction of projects, in the management of its own properties, and in the provisions of financial or technical assistance.

In order to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative, I have issued an Executive order on the protection of wetlands.

Protection of Wetlands

Executive Order 11990. May 24, 1977

By virtue of the authority vested in me by the Constitution and statutes of the United States of America, and as President of the United States of America, in furtherance of the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 et seq.), in order to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative, it is hereby ordered as follows:

Sec. 1. (a) Each agency shall provide leadership and shall take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands in carrying out the agency's responsibilities for (1) acquiring, managing, and disposing of Federal lands and facilities; and (2) providing Federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.

(a) This Order does not apply to the issuance by Federal agencies of permits, licenses, or allocations to private parties for activity involving wetlands on non-Federal property.

Sec. 2. (a) In furtherance of Section 101 (b) (3) of the National Environmental Policy Act of 1969 (42 U.S.C. 4331 (b) (3)) to improve and coordinate Federal plans, functions, programs and resources to the end that the Nation may attain the widest range of beneficial uses of the environment without degradation and risk to health or safety, each agency, to the extent permitted by law, shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. In making this finding the head of the agency may take into account economic, environmental and other pertinent factors.

(b) Each agency shall also provide opportunity for early public review of any plans or proposals for new construction in wetlands, in accordance with Section 2 (b) of Executive Order No. 11514, as amended, including the development of procedures to accomplish this objective for Federal actions whose impact is not significant enough to require the preparation of an environmental impact statement under Section 102(c) of the National Environmental Policy Act of 1969, as amended.

Sec. 3. Any requests for new authorizations or appropriations transmitted to the Office of Management and Budget shall indicate, if an action to be proposed will be located in wetlands, whether the proposed action is in accord with this Order.

Sec. 4. When Federally-owned wetlands or portions of wetlands are proposed

for lease, easement, right-of-way or disposal to non-Federal public or private parties, the Federal agency shall (a) reference in the conveyance those uses that are restricted under identified Federal, State or local wetlands regulations; and (b) attach other appropriate restrictions to the uses of properties by the grantee or Purchaser and any successor, except where prohibited by law; or (c) withhold such properties from disposal.

Sec. 5. In carrying out the activities described in Section I of this Order, each agency shall consider factors relevant to a proposal's effect on the survival and quality of the wetlands. Among these factors are:

- (a) public health, safety, and welfare, including water supply, quality, recharge and discharge; pollution; flood and storm hazards; and sediment and erosion;
- (b) maintenance of natural systems, including conservation and long term productivity of existing flora and fauna, species and habitat diversity and stability, hydrologic utility, fish, wildlife, timber, and food and fiber resources; and
- (c) other uses of wetlands in the public interest, including recreational, scientific, and cultural uses.

Sec. 6. As allowed by law, agencies shall issue or amend their existing procedures in order to comply with this Order. To the extent possible, existing processes, such as those of the Council on Environmental Quality and the Water Resources Council, shall be utilized to fulfill the requirements of this Order.

Sec. 7. As used in this Order:

- (a) The term "agency" shall have the same meaning as the term "Executive agency" in Section 105 of Title 5 of the United States Code and shall include the military departments; the directives contained in this Order, however, are meant to apply only to those agencies which perform the activities described in Section I which are located in or affecting wetlands.
- (b) The term "new construction" shall include draining, dredging, channelizing, filling, diking, impounding, and related activities and any structures or facilities begun or authorized after the effective date of this Order.
- (c) The term "wetlands" means those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats, and natural ponds.

Sec. 8. This Order does not apply to projects presently under construction, or to projects for which all of the funds have been appropriated through Fiscal Year 1977, or to projects and programs for which a draft or final environmental impact statement will be filed prior to October 1, 1977. The provisions of Sec-

tion 2 of this Order shall be implemented by each agency not later than October 1, 1977.

Sec. 9. Nothing in this Order shall apply to assistance provided for emergency work, essential to save lives and protect property and public health and safety, performed pursuant to Section 305 and 306 of the Disaster Relief Act of 1974 (88 Stat. 148, 42 U.S.C. 5145 and 5146).

Sec. 10. To the extent the provisions of Sections 2 and 5 of this Order are applicable to projects covered by Section 104 (h) of the Housing and Community Development Act of 1974, as amended (88 Stat. 640, 42 U.S.C. 5304 (h)), the responsibilities under those provisions may be assumed by the appropriate applicant, if the applicant has also assumed, with respect to such projects, all of the responsibilities for environmental review, decision making, and action pursuant to the National Environmental Policy Act of 1969, as amended.

The White House,
May 24, 1977
JIMMY CARTER

Members of the Task Force Designated by Congress

- Environmental Protection Agency (EPA)
- Federal Emergency Management Agency (FEMA)
- National Oceanic and Atmospheric Administration (NOAA)
- U.S. Army Corps of Engineers (USACE)
- U.S. Fish and Wildlife Service (USFWS)

Agencies That Were Asked to Participate on the Task Force

- National Park Service (NPS)
- U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS)

Appendix E **TASK FORCE AGENCIES**